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WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 31 APRIL, 1919 No. 4

Aerial Hunter Goes Gunning for Whales

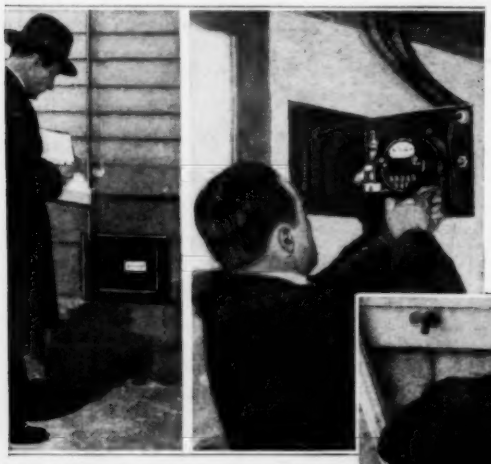
SPORT more extraordinary than shooting tigers from an elephant's back, or playing a quarter-ton swordfish with a casting rod, gave its initial thrill to an army lieutenant a short time ago when he went, in an airplane, machine-gunning for whales. From his vantage point a thousand feet in the air he saw his first game spouting four miles out at sea, and swooped down upon the big floating mammal before it could submerge. A sharp angle toward the sea, a quick tattoo of machine-gun bullets, a few lashings of foam, and the leviathan rolled over on its back. The successful hunter, flying back to shore, soon had a motorboat on its way out to pick up the kill. The vast carcass was towed ashore at Los Angeles, and a local packing firm

The Very Apex of Thrills—Machine-Gunning for Whales from an Airplane—was Initiated by a United States Army Lieutenant, Who Got His First Animal Four Miles from Shore. The Steaks and Oil from the Body of the Vanquished Leviathan Yielded a Nice Profit to the Intrepid Hunter

undertook to dress and pack the meat. Whale steaks are considered delicacies nowadays, and besides, the flying Nimrod found a considerable profit in the large quantity of valuable oil taken from the animal. Perhaps there will have to be a closed season on whales when the sporting airplanes get to flying in numbers.

NO NEED TO ENTER HOUSE TO READ THIS METER

Miscreants who use impersonation of meter readers as an "open sesame" to dwellings on which they have designs, are now foiled by a form of meter which is read from the outside of the house. Time and annoyance are also saved both the reader and the housewife. The meter box, especially adapted for electric-light circuits, is built into the foundation wall of the building; this may be done, however, after the building is erected. Once in operation, the only way the meter box can be opened is by breaking the glass in front of the dials. The hand is then inserted to release the catch and the entire front door removed. After inspection or adjustment a new glass is put in and the door snapped shut, making the meter impervious to moisture or tampering.



Meter Box Built into House Wall Allows Meter to be Read from the Outside, without Annoying Reader or Housewife. It may be Tested by Opening the Back, inside the Building, as at the Right Above

By Breaking the Glass before the Dials the Front of the Box may be Taken Out to Adjust the Meter. A New Glass Makes It Impervious to Moisture or Tampering

¶Two electric generating stations will be built in Morocco by a company with about $500,000 capital. The power will be used in Fez.

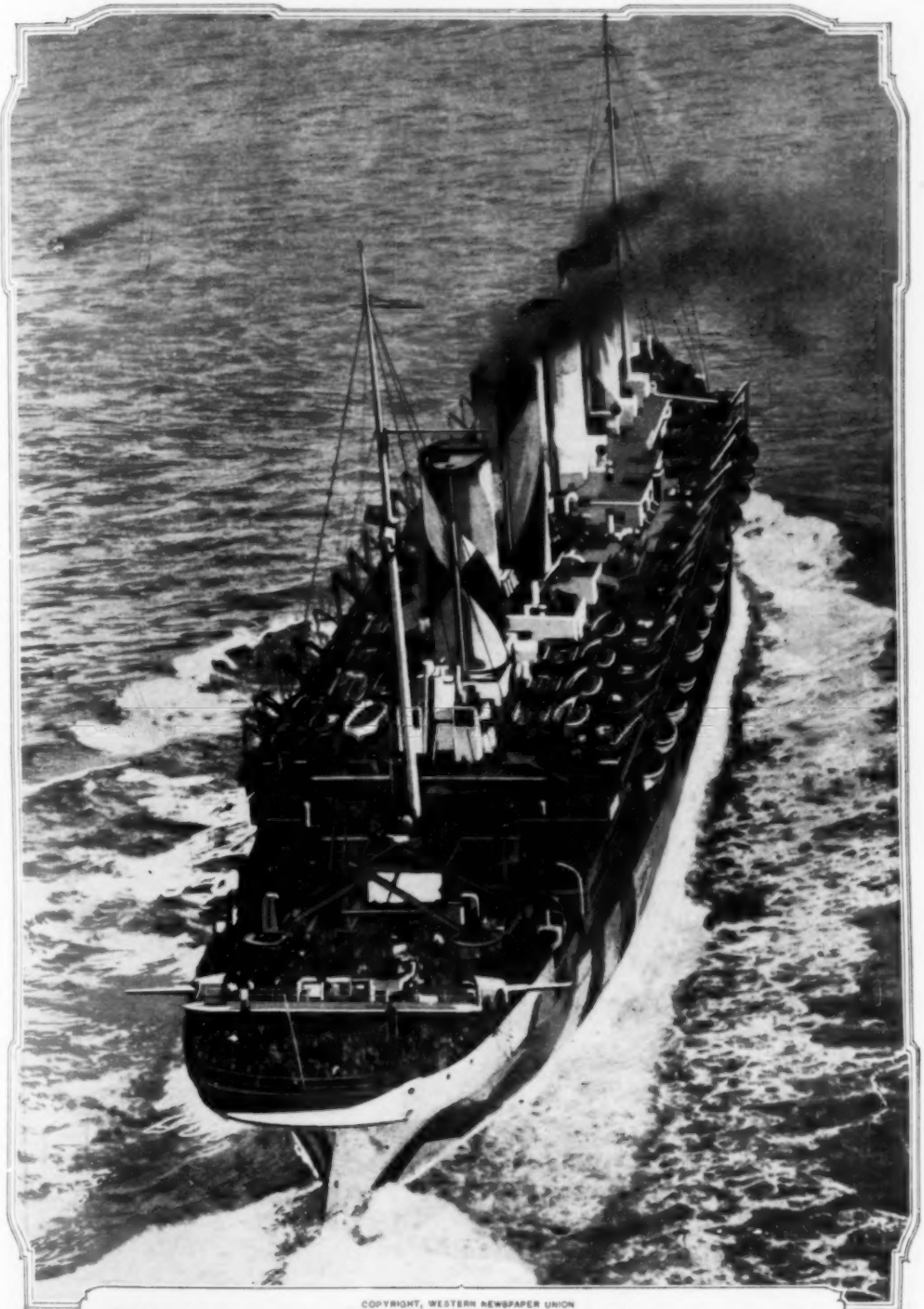
CATTLE VISIT IN CALIFORNIA OVER INCLEMENT SEASON

California pastures the past winter harbored several hundred carloads of Nevada cattle and sheep, shipped in to avoid the December and January cold of the open ranges. In the spring they will go back to their home state. Naturally, this winter resorting of common range stock is not specially altruistic, but is inspired by good business motives. California pastures afford more economical winter feed, and the sheep go through the lambing season with far less loss. With all the devices of tents and lambing wagons, bad weather often takes half the increase in lambs. So, change of climate is really an economical measure, with the recent prices for early lambs. Large numbers of stock are often moved from dry to green pastures, but this is the first important shipment recorded of range stock from a winter to a summer climate.

SHOULDER PADS AND HEAD GUARD FOR FOOTBALL PLAYERS

To reduce as far as possible the effect of impact of the player's cranium against Mother Earth, or other more or less solid objects, a football coach and official has designed a helmet and shoulder pads along improved lines. A series of leather pads, usually four, inside the helmet, are tightened with a drawstring, leaving spaces between them which act as air cushions. The shoulder pads are adjustable to the individual, and are shaped to give full protection to certain muscles sensitive to injury.

"MAURETANIA" BRINGS AMERICAN TROOPS HOME



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HOMEWARD bound, loaded with American troops, the "Mauretania," sister ship of the immortal "Lusitania," here is seen in unusual aspect. The picture, taken from an English dirigible, shows plainly the great trough the mighty vessel makes; but no adequate sense is conveyed of the immensity of this floating colossus.

ART AND ARTILLERY

By E. T. BRONSDON

"THERE'S a machine-gun emplacement up there beyond that clump of bushes, or in 'em. Because we came up so quick I ain't got the data, so until H. Q. sends it along you guys just concentrate direct fire . . . which clump of bushes? Oh, that one, up there to the left of that busted tank . . . say about a hundred yards north of the old tower at Bingville . . ."

This is exactly the fashion a civilian might have tried to designate a target for a battery of six-inchers. The fire sergeant and the expert enlisted gunners would have had a good laugh. It is exactly the manner in which a trained battery commander would not have issued the same order. This is more the manner:

"Approximate range 1,400 yards. In the immediate foreground a cairn of white stones—probably a Hun brass hat, or something. Two o'clock from there, 500 yards, a single tree. Twelve o'clock from the crotch, a disabled Willie. Eleven o'clock from there, a clump of bushes. Machine-gun emplacement. Bracket fire." And the men with the six-inchers would have "been with him all the way." There would not have been a question concerning the target, because he would have designated it exactly.

The reason why the trained man would have been able to eradicate all doubt in the minds of his subordinates immediately was because he himself had spent dozens of hours taking stiff instruction in the exact manner in which to make such a point clear. Time is measured in money in civil life; in war its bills are paid in blood. Confusion in commands means a loss of men.

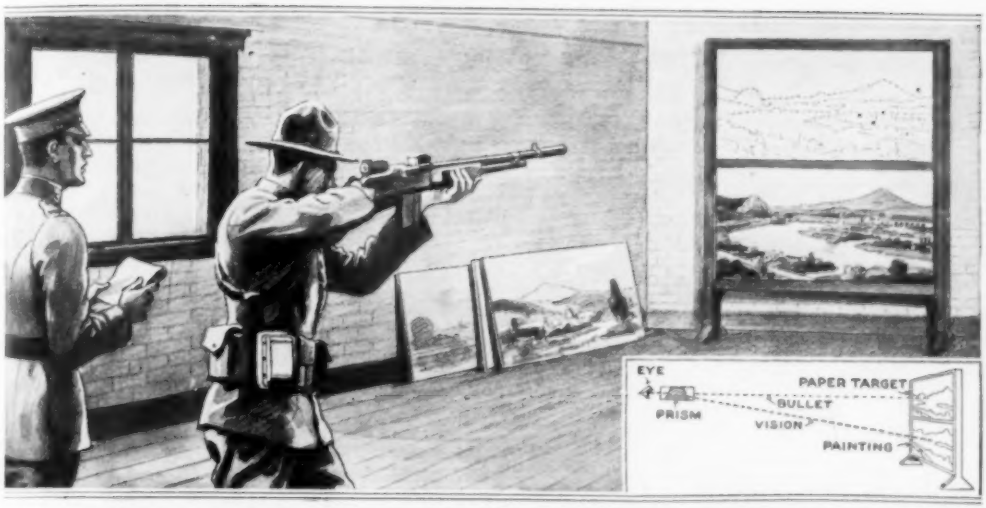
When the officer himself was being trained, he was taken to a lecture room. Here several gigantic paintings were placed before him. Day after day he selected all possible targets, and according to a scheme of vocal designation based on clearness and common sense—the main principle being to take the listeners from the foreground to the target by easily recognized landmarks—he learned how to "place" anything accurately which the eye could see.

The big paintings used in the officers' training camps and at the draft camps of the United States were furnished by our native artists, working under the supervision of the Division of Pictorial Publicity. Many came from the members of the Palette and Chisel Club.

The pictures themselves made little pretension to artistic merit. In most cases they measured 10 by 20 ft. in size, and were adaptations of smaller 'scapes that perhaps made some such claim. In each, however, the original subject had been laid aside; instead of the elimination of detail now so important in American art, detail

PHOTO BY JULEY, NEW YORK

Paintings Used for Instructing Soldiers in the Method of Designating Targets Measured About 10 by 20 Feet. They Made Little Pretension to Artistic Merit but Were Full of Detail



When the Paintings were Used as Direct Targets, a Prism was Placed on the Rifle to Change the Line of Sight, and the Bullets Passed through a Mimeographed Reproduction of the Picture. The Small Diagram Gives the Arrangement

was glorified. Just as many fences, houses, hedgerows, hills, roads, brooks, and other natural and artificial objects were crowded into the paintings as would be compatible with the aims of training. As art they became atrocities, but as textbooks in range finding they became useful.

Because artillery in the great war was nearly always concerned more with indirect than with direct fire, this training, while fundamentally necessary, was not as important as it was in the case of riflemen and machine gunners, who in most cases had to use direct fire. With these latter groups an addition to the system noted above was made.

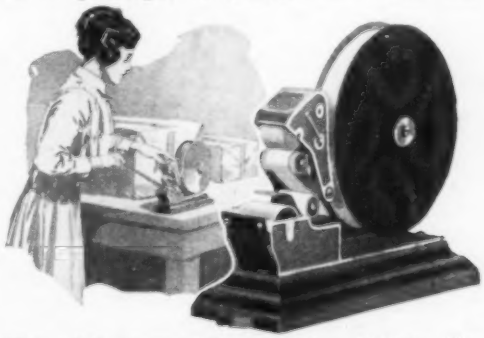
When the work in target designation was concluded, the paintings were used as targets. That is, the men aimed and fired their machine guns or rifles at objects designated to them which appeared on the paintings.

The manner in which this was done without riddling the paintings themselves was by the use of a prism lens, set on each rifle or gun. At a given distance from the target, this l ns showed the painting while the muzzle of the weapon actually pointed above the painting itself. Thus, when the shot was fired at the "clump of bushes," or what not, the bullet passed above the painting, giving the marksman just as much practice in aiming and firing as if he had drilled a hole in the canvas.

Lightly mimeographed paper targets were set immediately above the paintings, and the range and prism lenses adjusted so shots registered hits on the paper exactly as the rifleman aimed and shot at the painting. After each paper duplicate of the painting had served its purpose it was torn down, and the accuracy of the fire criticized.

PRINTS GUMMED TAPE AS IT IS USED

Since the price of string went up, gummed-paper tape has become the popular package fastener. Merchants who realize the value of advertising can get a small machine that will print anything they want on the tape while it is being pulled out for use. In a space only 10 by 8 by 2 in., this little mechanism holds 800 ft. of gummed tape, a printing press, a moistener, and a cut-off knife. When a strip of tape is pulled off for attaching to a package, it comes out with the

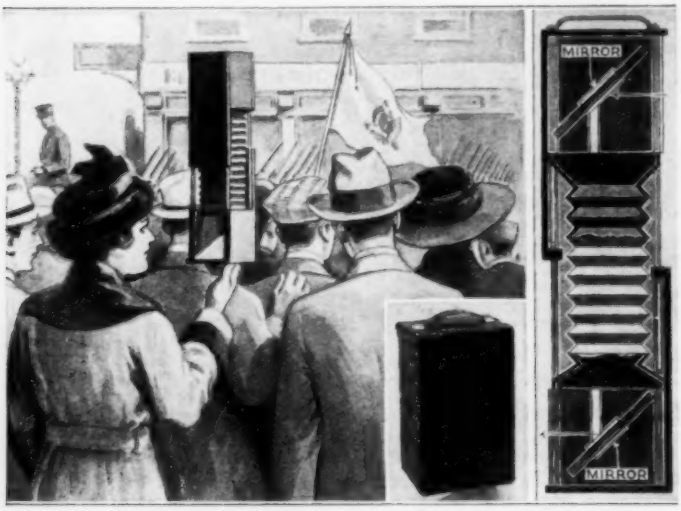


This Little Gummed-Tape Printing Machine Has Its Printing Roller, Moistener, and Cut-Off Knife All in Plain Sight

gummed side wet and the ink side dry. The imprint is made every three inches.

COLLAPSIBLE PERISCOPE FOR USE IN CROWDS

Shortness of stature need no longer be a handicap to a person in a crowded street anxious to view a passing parade, or the



It Looks and Opens Up Like a Camera, But Is a Periscope, Designed to Give a Short Person in a Crowd a View of a Passing Parade. The Sectional Sketch at the Right Reveals the Optical Arrangement—Simply a Pair of Mirrors at a 45-Degree Angle

like, if he is provided with a special collapsible periscope, recently devised for just such occasions. It consists of a case, having a mirror set at the proper angle at either end, which can be extended to a length of 2 ft., or more, by reason of a bellows connecting the two ends. With the device lengthened, the mirrors are exposed so that the user can see over the heads of a crowd without difficulty. Folded, the periscope looks like a box camera.

EXPERIMENTS WITH FISH OILS TO DETERMINE EDIBILITY

The Bureau of Fisheries has been experimenting for some time with various fish oils to determine the practicability of rendering them for edible purposes, and also of marketing them commercially. For a number of years past Denmark has been using vast quantities of fish oil in the margarine industry, and only recently Norway has taken up the matter with the idea of employing it in the same manner. Experiments thus far have shown that fish oil is excellent for making margarine that keeps and tastes well, and is even better suited for lard making.

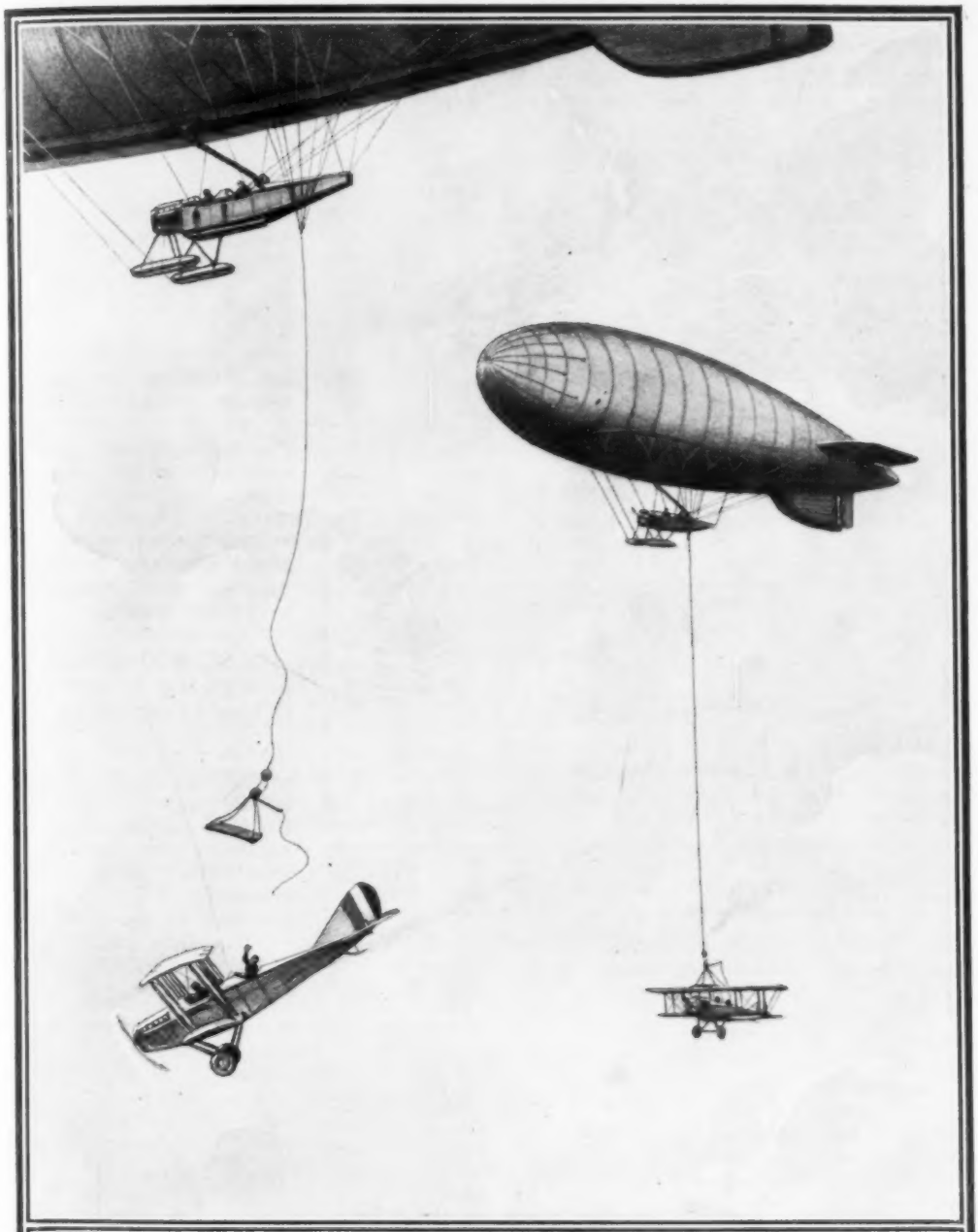
WONDERFUL RESULTS OBTAINED IN SUBSTITUTE SEARCH

That necessity is truly the mother of invention has been amply demonstrated by Germany in her search for substitutes to take the place of materials she was unable to obtain during the war. The thoroughness with which she prosecuted this search was made known at a recent festival held in Hamburg for the purpose of giving out the results obtained from their experiments with the lupine genus of plants. A Berlin professor has succeeded in removing all alkaloid and bitter substances from the seed of this plant and has thus made every part of it available for some use. At the Hamburg banquet the table cloth, every item on the menu, the soap used by the guests in washing, and even the writing paper and envelopes furnished, were made from the products and by-products of lupine.

WRIST WHISTLE FOR SOLDIERS AND POLICEMEN

The wrist whistle is becoming the companion of the wrist watch, and like the latter, is proving popular with army officers, a large number having been ordered by the government. The new whistle is of the siren type and is 3⅜ in. long and ⅞ in. in diameter. It is fastened to the left wrist by a leather band. In warfare and peacetime maneuvering it is of the utmost importance that an officer's whistle be instantly available for giving commands, and when attached as indicated, there is no delay in using it. The new article is also well suited to the needs of policemen, referees, and others.

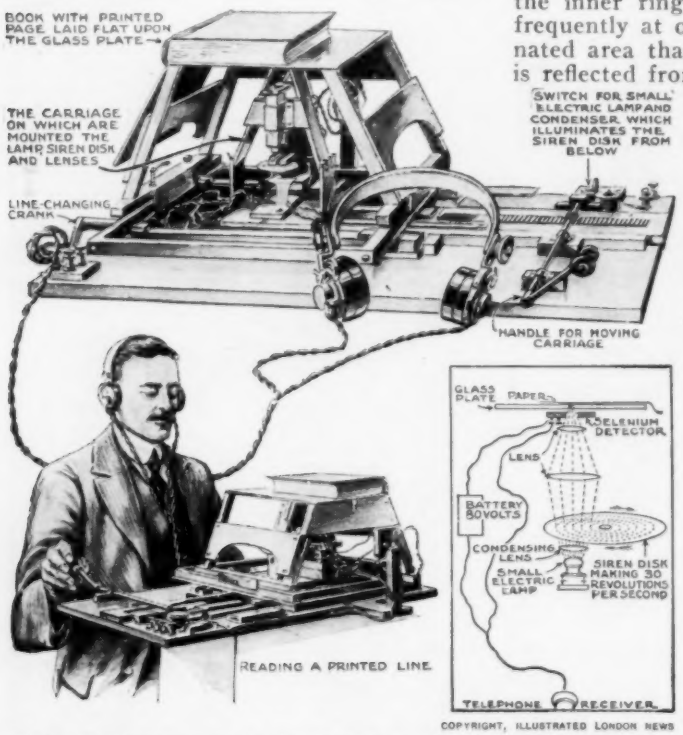
DIRIGIBLE LAUNCHES AEROPLANE IN MID-AIR



ROCKAWAY BEACH, L. I., was recently the scene of the unusual aeronautic experiment illustrated above. An army aeroplane suspended beneath one of the navy's "Blimps," at an elevation of 3,000 ft., was successfully launched in mid-air. A cable, possibly 100 ft. in length, was attached to the dirigible. At its lower end it was supplied with a contrivance apparently designed to fit over and grip the center section of the top plane. Means of instantly releasing the aeroplane were at the pilot's disposal. When the machine was freed, it dived several hundred feet, flattened out, and disappeared in the distance. No announcement has been made regarding the purpose of the test. It recalls, however, suggestions made in the past that an aeroplane and dirigible be combined so that in the event of the gas bag meeting disaster, the plane, taking the place of the ordinary nacelle, might be released in the manner described.

MARKED IMPROVEMENTS IN EAR-READING DEVICE FOR BLIND

Marked improvements have been made in the apparatus known as the optophone, with which the blind can read ordinary print by ear. As in earlier devices of this character, selenium is used in transforming light reflected by letters into sounds, each different from the other. With the new instrument, recently exhibited in London, a page is placed with printed face down on a glass-topped rack, beneath which is a movable carriage supporting a perforated selenium detector close to the page, while below is a lamp, the rays of which, concentrated by lenses, shine upward through a revolving perforated disk to the page. The perforations are arranged in five concentric circles, and the rays as they pass through them form a row of dots equal in length to the letter "I". Since the holes in the outer rings move swifter than those in the inner rings, the flashes occur more frequently at one end of the tiny illuminated area than at the other. The light is reflected from the letter on which the rays fall to the selenium, whose resistance is decreased in proportion to its exposure to the light. The result is, that, as different letters are illuminated, they produce different sounds which the reader learns to distinguish. It is said the characteristic sounds of each letter can be learned in the course of a few weeks. Thus far the actual reading record is about 10 words per minute, but greater facility is expected shortly.


BOOK WITH PRINTED PAGE LAID FLAT UPON THE GLASS PLATE
THE CARRIAGE ON WHICH ARE MOUNTED THE LAMP, SIREN DISK AND LENSES
LINE-CHANGING CRANK
SWITCH FOR SMALL ELECTRIC LAMP AND CONDENSER WHICH ILLUMINATES THE SIREN DISK FROM BELOW
HANDLE FOR MOVING CARRIAGE
READING A PRINTED LINE
GLASS PLATE
PAPER
SELENIUM DETECTOR
LENS
BATTERY 80 VOLTS
CONDENSING LENS
SMALL ELECTRIC LAMP
SIREN DISK MAKING 30 REVOLUTIONS PER SECOND
TELEPHONE RECEIVER

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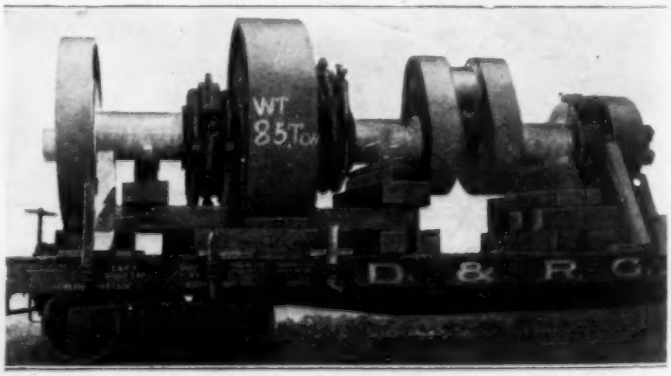
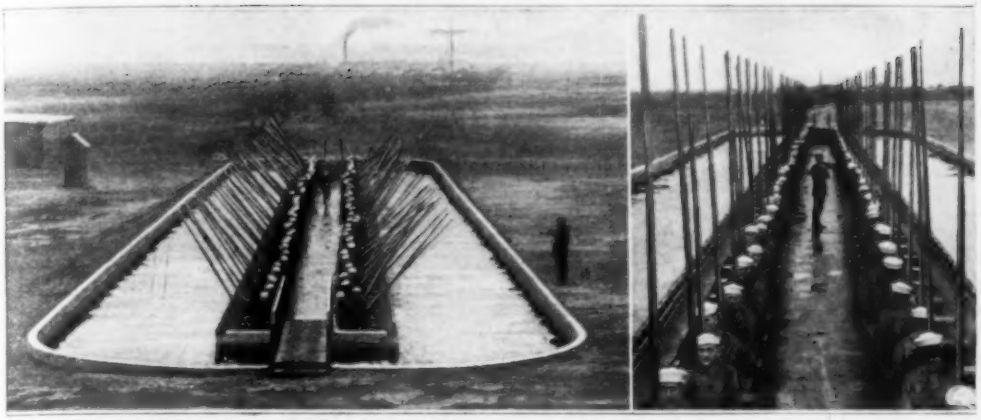
With This Improvement in the Optophone, Any Printed Page may be Laid Face Down on the Glass-Topped Stand and, with the Apparatus Underneath in Action, a Blind Person can Hear in the Telephone Characteristic Sounds for Each Letter. The Diagram in the Corner Shows the Location of the Selenium Cell, Light, and Shutter

CAST BIG STEEL CRANK SHAFT TO SAVE BUSY FORGES

Because all the forges which could have handled the work were busy on war orders, a crank shaft, 24 in. in diameter, was cast in three sections of open-hearth steel at Pueblo, Colo. The crank and shaft were fitted together by shrinking and keying, making a satisfactory job.



This Big Crank Shaft, 24 Inches in Diameter and Weighing 85 Tons, was Cast in Three Sections of Open-Hearth Steel Because All the Forges Were Busy on War Work



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With This Concrete Rowing Machine, Hard Aground in a Pond, the Sailors of the Naval Training Station at Cape May, New Jersey, are Trained to Handle Heavy Oars. The Officer Directing the Maneuvers can Cross the Bridge at Either End for a Shore View, as in the Right-Hand Picture

The total weight of the crank shaft was 85 tons, the wrist-pin diameter being 24 in. The cast shaft replaced a broken one on a 10,000-hp. stationary, reversible engine.

MAKE QUICK MOTION VISIBLE WITH RAPID CAMERA

It was discovered some years ago that movement too rapid for the eye to follow, when photographed with a motion-picture camera operated at a higher speed than usual and projected on a screen at the customary rate, was "slowed down" so that all its details were visible. The process has recently been applied to the study of swimming and diving movements. The evolutions of a trained swimmer are recorded on moving film at a camera speed eight times the usual rate. Projected at ordinary speed, the deliberate play of each muscle becomes clearly visible, giving opportunity for comparison not only between swimmers, but between that multimuscular sport and other forms of athletic effort. Besides its scientific value, the prolonged record of underwater maneuvers also has a pronounced spectacular flavor.

Orchardists and nurserymen are reminded that this is the year of the 17-year locust, which scientifically is the periodical cicada and not a locust at all. It also has a 13-year period, and is due on both counts in one part or another of the United States. Although the damage done is generally exaggerated, protective measures for young trees are advised by the Department of Agriculture.

CONCRETE "BOAT" AT CAPE MAY TEACHES SAILORS TO ROW

Those who have handled only the light oars of pleasure boats on a gentle sea may not fully realize the difficulties of managing the multiple-oared auxiliary craft used by the navy. For the purpose of training sailors in this necessary duty, the Naval Training Station at Cape May, N. J., has built a concrete rowing machine consisting of a dummy boat of huge size with a row of oarlocks the full length of each side. The machine was built on dry land, but now occupies the center of a concrete tank, or pond. A bridge at each end establishes permanent shore connections.

UMBRELLA-SHAPED COIN BANK WARNS OF "RAINY DAY"

"Save for a Rainy Day"—the good old admonition that grandfather used to give—stares the thriftless in the face from the top of a new coin bank for children and grown-ups. And if further warning is needed, the top of the bank is shaped in imitation of an umbrella in the position approved for rainy-day use. Even the slot into which the owner's coin is dropped suggests, by its form, a threatening dash of rain. The device affords a ready protection from the milder financial storms.

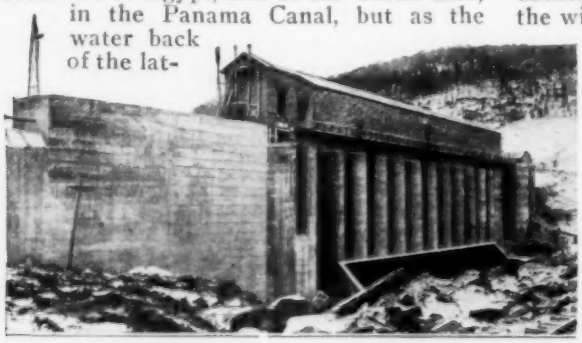
The Whole Downstream Side of La Loutre Dam, Quebec's Enormous New Storage Reservoir, Is Visible in This to a Width of 20 Feet on Top. It Contains 72,250 Cubic Yards of Masonry, All of the Material and Tools

QUEBEC HAS LARGEST STORAGE DAM IN NORTH AMERICA

By W. E. HOPPER

AN engineering work of unusual magnitude has recently been completed in the province of Quebec by the erection of an enormous storage dam on the St. Maurice River, designed to regulate the flow of that river which is used as a source of power by a number of large Canadian pulp, paper, and lumber companies.

It is known as the La Loutre dam, taking its name from the falls of that name, above which it is located. It is nearly 1,700 ft. in length, and when completely filled, will form a lake 300 square miles in surface area. The engineers engaged in the work claim that it is the largest storage dam of its kind in North America. In the whole world its storage capacity is exceeded by that of the famous Assuan reservoir in Egypt, and of the Gatun dam, in the Panama Canal, but as the water back of the latter is only used for a few feet on the surface it is in a different class from the La Loutre dam, where the water is meant to be used completely.



Upstream Side of the Main Section of the Big Dam, Including the Gatehouse and Sluiceways: The Latter are Covered with Steel Grating to Prevent Clogging by Timber, Ice, or Floating Rubbish

The St. Maurice River has a drainage area of 17,000 square miles. It takes its rise at a distance of about 360 miles north of Three Rivers. Its headwaters are from numerous lakes whose elevation is about 1,300 ft. above mean sea level.

The river is remarkable for its numerous falls and rapids, two of which are fully developed, and a third utilized only partially. Of the two developed, one is at Shawinigan with an available head of 150 ft., and the other at Grand'Mère with a natural head of 40 ft., and a possible head of 75 ft., as a result of the erection of the new dam.

The flow of the St. Maurice River varied from 200,000 cu. ft. per second during highest water to 6,000 cu. ft. per second at low water. The low-water stages occurred usually during August and September and the winter months, this being the cause of heavy losses by the industrial companies. It was to remedy this condition that the storage of water in the upper part of the river was decided upon.

In the summer of 1912, surveys were carried out and a dam site chosen immediately above the La Loutre Falls, at a distance of 240 miles, by the river, from Three Rivers; 50 miles above the mouth of the Mattawin River, a tributary of the St. Maurice, and about 40 miles due east of Parent station on the Grand Trunk Pacific Railway.

The Quebec Streams Commission, acting for the Quebec government, made contracts with the Shawinigan Water and Power Co., and other concerns, for the use of the storage water, and it is claimed that the annual revenue from

Panorama—a Concrete Wall Nearly 1,700 Feet Long, 80 Feet High, and Tapered from 72 Feet Thick at the Bottom for Which had to be Brought, by River Barge and Construction Road, 50 Miles from the Nearest Railroad Point

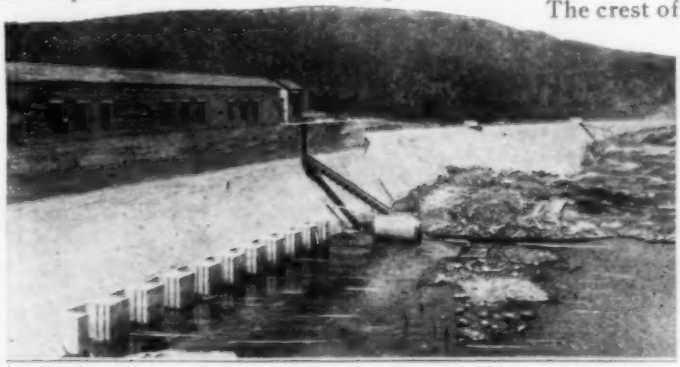
these contracts will leave a surplus, after deductions are made for interest, sinking fund, and maintenance. The contract for building the dam was let to a Montreal firm, who received $1,161,000 for the work. To this must be added the cost of surveys, plans, inspection, and administration, as well as the building of a hydroelectric plant and a 20-mile railway, bringing the total cost to about $2,500,000.

One of the big problems that had to be faced by the contractors was to get their building materials transported from the railway to the dam site. The method finally decided upon was to establish a base at Mattawin and to use the St. Maurice River as far as possible. Mattawin is about 50 miles from the dam site and all materials were first loaded onto specially constructed flat-bottomed barges and towed upriver a distance of about 30 miles. One of the obstacles to be overcome in this part of the journey was a rapids that had to be negotiated with the assistance of cables from the shore. At the end of the river trip, and at the foot of a long rapids that could not be successfully covered, another base was established, and from here a standard-gauge railway was built for the remaining 20 miles.

An idea may be gained of the magnitude of this transportation problem, when it is considered that all the railway equipment had to be carried up, as well as the material for building the dam, including some 300,000 bags of cement, 261 tons of reinforcing steel, and 452 tons of structural steel, and all the minor requisites for such a work, not forgetting a sawmill equipment, lumber for storehouses and dwellings, and provisions for the 500 men engaged in the work, during a period of more than four years.

About two miles down the river from the dam a hydroelectric power station was erected, which develops 1,000 hp., and this was used in the work of erecting the dam, supplying light for the buildings, heating, cooking, etc. Since the completion of the work, the plant is utilized for the gate-raising machinery, lighting, or any purpose for which power may be necessary.

The dam is of the type known as gravity section, of so-called cyclopean masonry. Its maximum section is 80 ft. above the bed of the river and the minimum width on top is 20 ft. It is built in four angular sections, to conform to the topography of the stream, and varies in its dimensions. The base is at least three-quarters of the height, and its maximum width is 72 ft., the upstream face being vertical. It contains 72,250 cu. yd. of masonry.



This Downstream View Gives a Better Idea of the Sluice Outlets Than can be Obtained from the Panoramic Picture Above. The Log Chute, a Necessary Feature of North-Woods Dams, Is Also Visible

The crest of the dam from end to end, is 1,646 ft. long, at an elevation of 1,335 ft. above mean sea level.

The weir is 840 ft. long, and the dam is provided with 10 bottom sluices, each 12 by 7½ ft. wide, through which the flow of water is regulated by steel gates. There

is also a log sluice for controlling the supply of logs for the lumber operators of the region.

The dam will store the waters from a drainage basin of 3,650 square miles. It unites a series of small natural lakes, taking in 205 square miles in lake area, and when the reservoir is full, the engineers figure that it will form a lake 300 square miles in area. This means the flooding of some 95 miles of crown lands, some of it well timbered, but much of it barren. Its capacity in cubic feet is variously estimated at from 160 to 200 billion, and if all the water could be retained it would take three years to fill it. Last year was exceptionally wet so that it was possible to fill it to more than a third of its capacity.

The water thus stored, it is claimed, will be sufficient to regulate the minimum flow at Shawinigan to 12,000 cu. ft. per second. It will decrease considerably the spring floods and will increase the power at Shawinigan, Grand'Mère, and La Tuque to 67,000 horsepower.

While the dam was built principally for power purposes it will also benefit the log-driving operations on the St. Maurice River, and will give a tremendous impetus to the general development of the hinterland of Quebec.

REPRODUCE NOTED PAINTINGS FOR MOVIE PATRONS

That movie audiences are not wholly given over to the vulgar delights of slapstick comedy and galloping melodrama, but really have a large appreciation of the esthetic, has been demonstrated by the manager of Buffalo's largest theater. Reproductions of famous paintings, made large enough to fill the screen area of the theater, are presented every week and enthusiastically received. The initial presentation, at which Whistler's "Mother" was the main attraction, aroused so much interest that three artists were permanently engaged by the management to turn out a weekly art reproduction. Carefully studied lighting effects enhance the value of the presentations, which are locally regarded as constituting a popular education in art and a reproach to the cynic's theory of "popular taste."

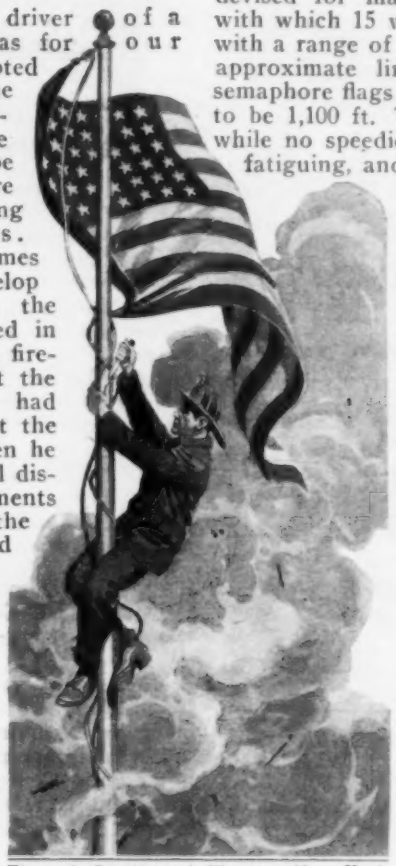
This Heroic-Size Reproduction of "Washington Crossing the Delaware" Is One of a Series of Famous Art Studies Presented at a Buffalo, New York, Movie House

POTATOES SAVED FROM FROST BY USE OF SMOKE SCREEN

Threatened with the loss by freezing of his 20-acre crop of late potatoes, an enterprising Ohio farmer last fall saved the entire lot by the ingenious use of a smoke screen. Because of dry weather in July and August, the potatoes had made very little growth. They were just beginning to mature nicely when the temperature took a sudden drop in September. In anticipation of just such an emergency, however, baled straw had been placed in the most advantageous spots in the field, and fires were started at 10:30 at night. It was found that a much heavier smoke could be produced by the use of wet straw, and this was employed after the flame had been applied. Fires were kept going all night, and the next morning the success of the experiment was assured when it was found that the potatoes were still green while other vegetation, not covered by the smoke, had been destroyed. Approximately 10 tons of straw were used in this fight against nature.

FIREMAN'S CLIMB SAVES FLAG ABOVE BURNING BUILDING

The regard which the driver of a New York fire truck has for our national emblem prompted him, on arriving at the scene of a recent fire, hurriedly to break into the burning building and grope his way to the roof, where stood a tall flagstaff flying the Stars and Stripes. Though the smoke and flames at times seemed to envelop the base of the pole, the breathless crowd gathered in the street below saw the fireman climb the staff, cut the ropes which the wind had badly tangled, and thrust the flag under his coat. Then he slid down to the roof and disappeared. A few moments later he emerged from the building unharmed and took his place at his truck.



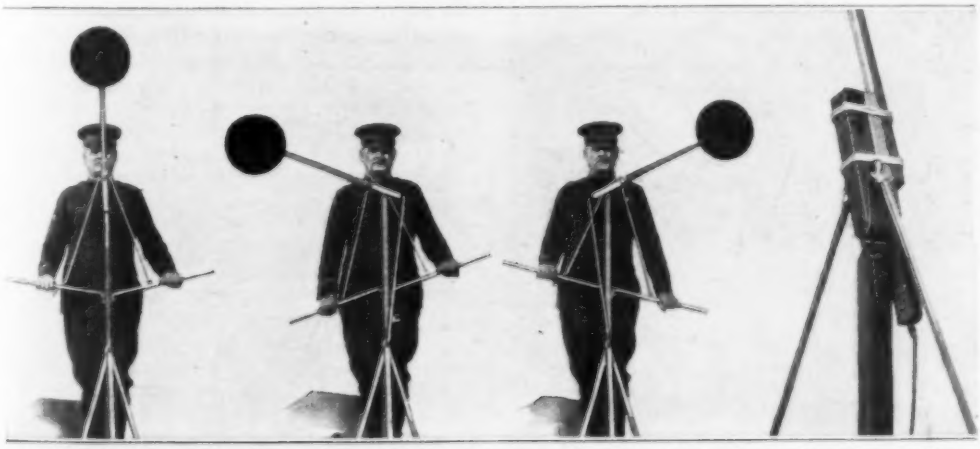
Through Smoke and Flame a New York Fireman Scaled the Flagpole on the Roof of a Tall Burning Euilding and Rescued Old Glory

WIGWAG SIGNALING MACHINE INCREASES VISIBILITY

Experiments conducted by a Signal Corps officer with disks of various sizes as a substitute for the semaphore flags used in wigwag signaling, demonstrate that greater visibility is attained with the disks. A simple machine was devised for manipulating a 12-in. disk, with which 15 words a minute were sent with a range of visibility of 3,000 ft. The approximate limit of clear reading of semaphore flags with the naked eye seems to be 1,100 ft. The machine movements, while no speedier, are more regular, less fatiguing, and less apt to be obscured. The disk of cloth and wire is black on one side and wh e on the other, selection depending on the background. The disk arm is held normally vertical by a spring, and moved to the right, for dots, o the left, for dashes, by depressing one handle or the other. The whole device weighs less than five pounds, and could readily be made long enough for trench use.

NEW DOUBLE-DECK SANITARY CAR FOR SHIPPING HOGS

In an attempt to prevent as far as possible the spreading of infectious diseases to other animals, two double-decked cars for the conveyance of pigs have recently been de-

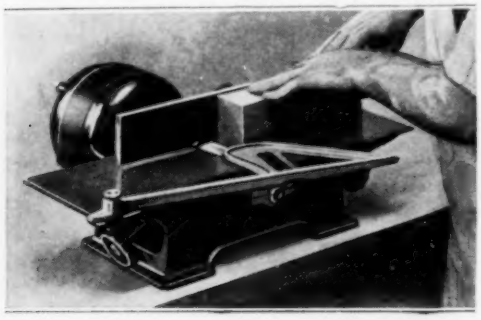


Signals Made with This Light Wigwag Machine Are Visible Over Half a Mile. The Second Picture Indicates the Movement for a Dot, the Third for a Dash. The Right-Hand View Reveals the Simplicity of the Hinged Arm with Its Spring and Cords

signed in Europe. Sheet iron is fixed to the ribs of the wagon to a height of about 20 inches above the floor, and the sliding doors are made water-tight. The floors are drained to a gutter in the middle, permitting all refuse to enter two closed iron containers below the floor of the cars. One type of car is fitted with removable flooring, while the floor of the other is a part of the structure. The troughs may be filled through external hinged doors, one door for each trough.

PORTABLE WOOD-PLANING TOOL ELECTRICALLY OPERATED

Something between the hand plane and the big stationary joiner is useful for



Portable Bench Plane Run by a Small Electric Motor: An Automatic Safety Guard Protects the Blades at All Times

cabinetwork and pattern making. A small, light, electrically driven bench plane will supply the need. The tool may be equipped with either alternating or direct-current motor. For direct-current use, the machine has a two-blade cutter head, and for alternating current a three-blade head; the reason being that only 3,600 r. p. m. can be attained with 60-cycle alternating current, while the two-blade plane requires about 4,000 r. p. m. An automatic safety guard keeps the blades covered at all times.

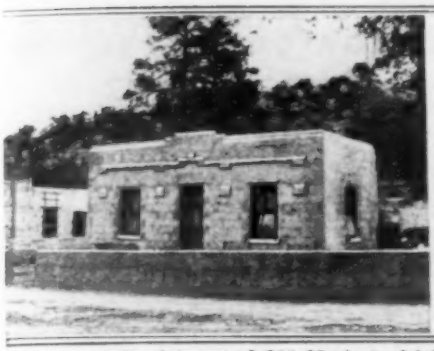
ELECTRIC-METER SUBSTITUTE SAVES TIME AND EXPENSE

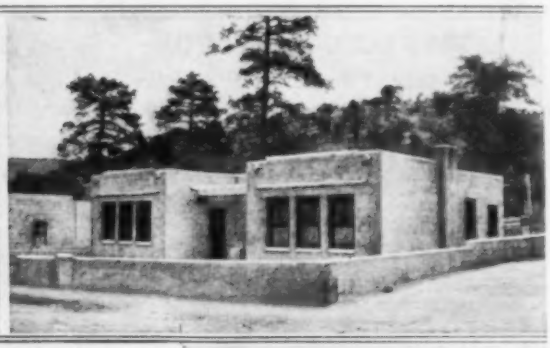
With the object of eliminating the direct-current meter used by small consumers, and the attendant meter reading and bill calculating every month, a Chicago inventor has developed an electrolytic metering can, said to be distinct from any earlier device of the kind. It is designed automatically to open the circuit and to cut off the service as soon as a specified amount has been used. The measurement is accomplished by the action of a small shunt current on an anode, which is gradually consumed while current is being used. When this anode is completely consumed, the main circuit opens, and the service is cut off.

PORTABLE COMMISSARY TAKES FOOD TO SHOP WORKERS

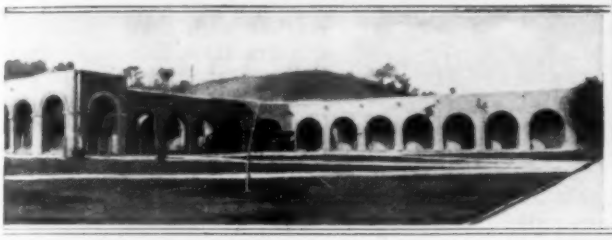
Now even "Apple Mary" and "John the Fruit Man" are threatened with displacement by labor-saving machinery. A big Wisconsin factory has installed a traveling commissary in the form of a truck with compartments for all manner of delicacies. One side has tanks full of hot coffee, milk, and tea; the other side carries in plain sight apples, pears, grapes, chocolate bars, and all the other customary treats of the worker. The raised cover serves as a bulletin board for shop and athletic events.

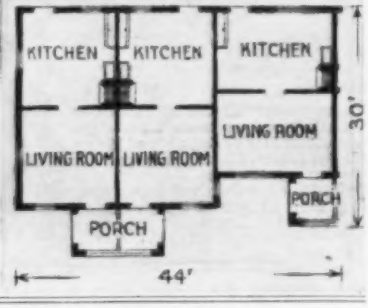
Hot Coffee, Tea, and Milk are Served on One Side of This Portable Commissary, and Fruit and Other Delicacies on the Other. Every Noon It Makes the Rounds of a Big Wisconsin Factory





Architecture Reminiscent of Old Mexico's Adobe has been Used Intentionally in the Housing of Mexican Laborers in a New Mexico Mining Town, the Material Used, However, Being Concrete, Variously Tinted, and with Modern Improvements Installed. Above Are Two Types of Cottage





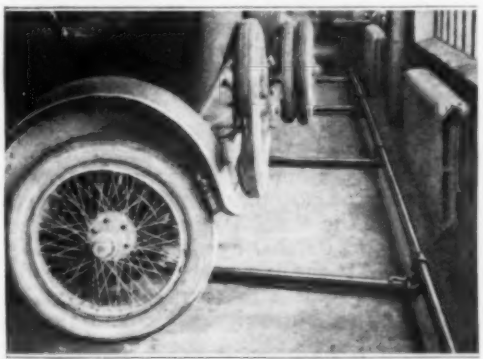
The Long, Low, Romantic-Looking Building Depicted Above Is the Imitation-Adobe Railroad Station at Tyrone, New Mexico. To the Right Is a Typical Floor Plan of One of the Triple Two-Room Houses Whose Homelike Atmosphere has Kept the Labor Turnover Low

ADOPT ADOBE ARCHITECTURE FOR NEW MEXICO HOMES

Stories of Old Mexico and the states that border on the Rio Grande abound in references to and descriptions of the adobe huts and mansions of that romantic region. It is a fact that, without the adobe feature in his landscape, the Mexican laborer suffers from a nostalgia that impedes his productiveness. That is the main reason why those who faced a labor-housing problem in the mining town of Tyrone, N. M., selected the boxlike architecture of the old Spanish settlements for their model. Cement was found to create a permanent substitute for dried mud, with satisfying fidelity to the original. Of course the primitive fitments were discarded, and the little homes have the gas ranges, electric lights, and water and sewer connections of a modern apartment. Window and door arrangements also have been given a civilized touch. The cement, laid on a wood frame, is tinted in pinks, blues, grays, and tans, in true Spanish style. The delight of the Mexican laborers in dwellings that do not disturb their traditions has kept down the labor turnover in the town, and the women take kindly to the conveniences.

PIPES CARRY MOTOR EXHAUST GASES OUTDOORS FROM AUTOS

In a mid-western branch factory of a motor-car company, a pipe system has been installed to carry off the exhaust fumes when engines are operated indoors. A long pipe is supplied with several laterals which are connected to the exhaust pipes of the cars by means of flexible



The Exhaust Gases of the Motor-Car Engines are Carried Out of the Plant by the Piping That Extends along the Floor

couplings. The arrangement is one that might easily be adapted in almost any private or public garage.

WEED-CUTTER ATTACHMENT FITS ON CULTIVATOR

Weeds turned back by the shovels of an ordinary farm cultivator have a habit of straightening themselves up again and continuing to grow. A weed cutter has been designed for attachment to the beam of a cultivator, which may be used either with or without the cultivator shovels, or may even serve in itself as a shovel for the shallow cultivation often practiced in certain seasons. The two long knives of the weed cutter are attached at an angle, which may be varied by adjusting the bolts of the frame. The depth of the cut, or height of the blades in relation to the ground, is also variable. Attached at an angle opposite to that used in cutting weeds, the blades act to roll dirt to the cultivated crop.

The Angular Blades Attached to This Cultivator Form a Weed-Cutting Attachment Capable of Many Adjustments, Three of Which are Shown. It Also Makes a Good Shallow Cultivator and Fits Any Standard Cultivator Beam

FARMING POLICY OF ENGLAND TO BE ALLOTMENT PLAN

It is to the land-allotment holder that Great Britain is looking for assistance in the food situation, particularly as regards the supply of potatoes, and it is planned to increase the number of allotments from 1,500,000 to 2,000,000 by the next planting season. At the present time there is only about one allotment to every 10 or 12 families, but by taking advantage of a large amount of land that has been growing up in weeds, it is hoped to have this up to one allotment for every five families. There are, even now, several cases where there is a plot for every three, and in one or two cases, every two households.

AMERICAN SHOES ARE POPULAR AMONG ALL CHINESE PEOPLE

According to a report issued by the Department of Commerce, American shoes are in high favor among all classes of Chinese. The average native, however, is unable to secure them because of the high prices, and is obliged to content himself with cloth footgear, or with very poor imitations of the American style of shoe. Leather shoes are only for the wealthy. Previous to the war, Russia was an important factor in the Chinese shoe trade, but since then Japan, which is supplying the market with a shoe made in western style, has secured the bulk of the business. Practically all of the high-grade leather imported into China for use in shoes comes from the United States, while the lasts are made in Japan and are copies of staple American styles.

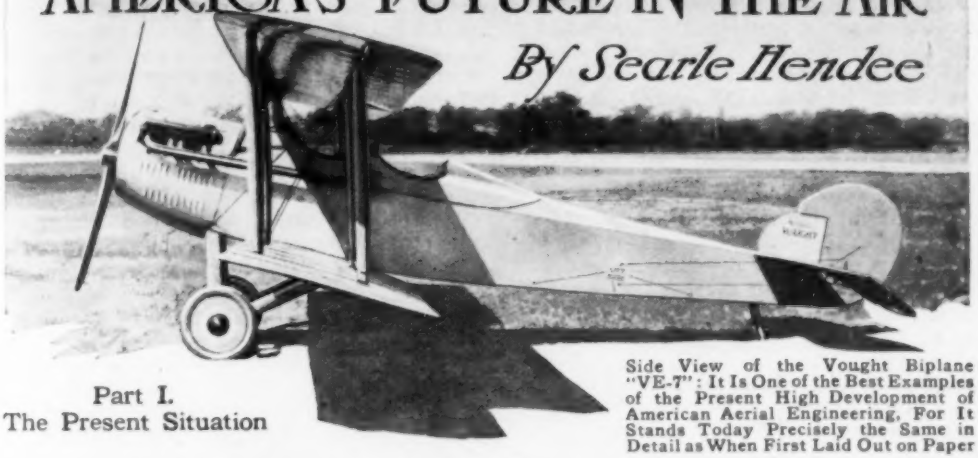
WIRE-STRETCHING TOOL HAS NO FRAME

Extreme lightness is attained in a recently designed wire-stretching tool by doing away altogether with the usual frame for holding the parts, which in this case are all assembled on the shaft of the device. The shaft, with its handle and ratchet, is the only moving part. Two iron claws engaging the near side of the post or pole, and one extending around the opposite side, hold the tool in position for use. A gear wheel fixed to the shaft acts as a ratchet, and is turned by a long hand lever with a pawl on it. Another pawl mounted on the shank of the front claws keeps the shaft from turning backward. The cable pulling the wire is wound around the end of the shaft. The compactness and simplicity of the mechanism give it great strength and unusual portability.

Holding Claws, Hand Lever, and Sprocket are All Mounted on the Shaft of This Wire-Stretching Tool, Doing Away with the Usual Heavy Frame

AMERICA'S FUTURE IN THE AIR

By Searle Hendee



Side View of the Vought Biplane "VE-7": It Is One of the Best Examples of the Present High Development of American Aerial Engineering, For It Stands Today Precisely the Same in Detail as When First Laid Out on Paper

Part I.
The Present Situation

Recognized Authorities Tell What They Think of Air Craft's Peace-Time Possibilities

CIVIL aerial transport in the United States, in other words America's aeronautical future, is fraught with great uncertainty.

Despite the fact that numerous plans of a commercial character are being formulated, we are threatened with a dormant period of aerial achievement, as compared with the extreme activity which Europe is expected to experience.

Our problem is not a technical one. We lack but one big thing, and that is a vigorous national policy.

On every hand the question is asked: "Has aerial navigation really a commercial future?" It has, according to competent opinion, but like anything else of new and revolutionary character, it must be developed.

To fully understand the situation that obtains, it is necessary to turn back to the darkest days of the war. America was assigned the task of putting certain types of air craft in quantity production. Machines and motors, thousands of them, were needed to win the war. For the purpose in hand, it was not so important that new types be evolved, as it was that existing models of known ability be built in great quantities with the utmost haste.

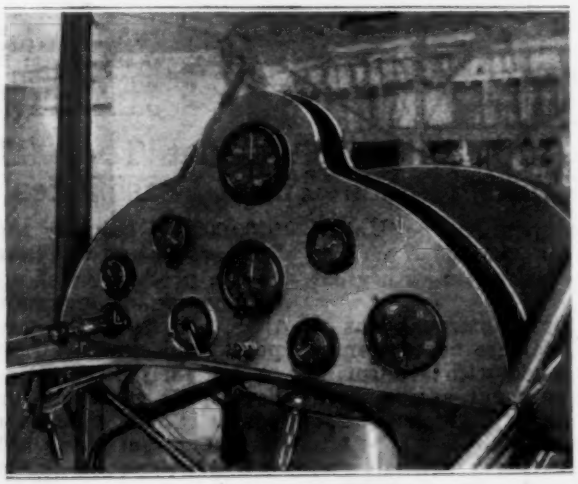
The aeroplane industry was organized into the Manufacturers' Aircraft Association and brought under Federal supervision. The foundation of this league is the cross-license agreement, which has enabled manufacturers to exchange ideas and patents on an equitable basis.

War demands in a few months built a $100,000,000 industry that employed 300,000 persons and was devoted almost solely to the production of standard types. It was impossible for manufacturers to find time, and, from the government's standpoint, undesirable for them to take time, to set their engineering staffs at work developing machines for peace-time purposes. Some experimenting, of course, was done, but along military lines. And to this is due the fact that today, although it is not widely known, we have a number of remarkable machines that are without peers anywhere in the world.

And while we are on the subject, some of these planes may be mentioned. Two of them are craft lately described in this magazine. One is the Glenn L. Martin dual-motored bomber which, in official tests of load-carrying and performance, has surpassed the records of all other machines in America and Europe. Practically every aeronautical authority cites this big biplane as the best in the world, "a flying machine," as Orville Wright says, "that flies like a flying machine." It is one of the few military types now being developed for peace-time uses. The Loening monoplane, with a speed of 150 miles an hour, is another war-time triumph, which, with the Vought "VE-7" advanced-training plane, shown by official tests to be "easily the best" in its particular field, is now coming forth as a sporting and fast express-carrying vehicle.

Because their every energy had been devoted to military work, manufacturers were literally left in mid-air when the

armistice was signed. Government contracts amounting to hundreds of millions of dollars were canceled. The industry had no new types of machines designed for passenger and freight transport. Therefore it was unprepared to meet peace-time conditions and take advantage of their possibilities. As this is written, more than three months after the conclusion of actual fighting, the government still maintains control of the air-craft industry. Manufacturers are not wholly free to go ahead on their own initiative, and the government has taken no step toward a constructive program. Nevertheless it is safe to state that there is not a permanent manufacturer in the country who is not now earnestly engaged, in so far as it is possible under existing circumstances, in devoting his attention to commercial plans for the immediate future.



Control Board with Instruments Now Used for the Operation of Aeroplanes: To Him Who Remembers the Early Planes, in Which the Airman Sat in an Outrigger with Only the "Joystick" and the Warping Lever to Help Him, the Board Alone Tells an Eloquent Story of the Development of the Art of Flying

One of two things is advisable. If the government is to retain control of aeronautics, a definite program must be adopted quickly, enabling the industry to pass safely through the period of several years that will intervene before commercial aviation can be placed on a stable, self-supporting basis. Or else a free rein must be given so that private interests can proceed on their own resources and build aerial-transportation systems step by step as public support is won.

In all of this, and what is to follow, I am merely presenting my interpretation of the views of the recognized aeronautical authorities with whom I have talked. It yet remains to be demonstrated what the aeroplane and the dirigible—now that the industrial production of helium gas makes the latter a practicable vehicle—are really going to accomplish in America. But that aerial navigation has a definite and important peace-time value can no longer be doubted, if faith is to be placed in the opinions of men in the industry, and the history of transportation used as a basis for analyzing future progress.

In this connection it is eminently worth while to see what was going on elsewhere while we were bending every effort to the successful prosecution of the war. On May 22, 1917, when the very existence of the empire was in the balance, the British government formed an imperial commission known as the Parliamentary Committee on Civil Aerial Transport. Its list of members reads like a "Who's Who in the United Kingdom." It was charged with the duty of determining the feasibility, or, perhaps more correctly, the possibilities, of civil aerial transport after the war. The investigations conducted were based on the scientific, commercial, and industrial aspects of the subject as well as on that of national defense. A few weeks ago the committee's final report was submitted to parliament as a basis for constructive legislation. Two very significant statements embodied in the findings briefly summarize the report and go far toward answering the question with which we are here concerned.

Quoting verbatim:

"(a) Cost what it may, this country [Great Britain] must lead the world in civil aerial transport.

"(b) The State must have a reservoir of aerial power capable of meeting a sudden demand for expansion of the naval and military air forces."

What more conclusive evidence is needed to convince one that at least there is more to peace-time aviation than the county-fair exhibition flights of pre-war days? To British students of the question—and they are cited because they have delved more deeply into the subject than Americans—the commercial value of air travel is so great that "cost what

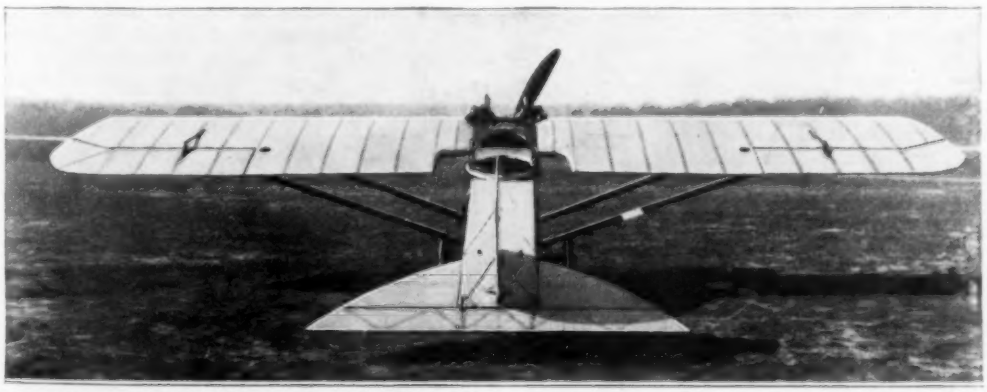
it may," aerial supremacy is a national necessity. Which means, if explanation be needed, that, as with its great merchant marine in the past, the sun must never set on Great Britain's air lanes—they must encircle the globe. Furthermore, it is an admission that henceforth "splendid isolation" is nonexistent and that aerial superiority must serve as naval supremacy has in the past.

The aeroplane is America's by right of discovery, but, in the opinion of competent judges, America must act, and do so quickly, if she is to reap her rightful measure of profit in its use. To illustrate what is meant, consider the telephone. It is a native invention and has benefited the American people more than those of other nations solely for the reason that it has been utilized more widely here than elsewhere.

The Aerial Mail Service, While at Present More or Less in an Experimental Stage, Nevertheless Has Some Promising Records to Its Credit and Undoubtedly will Become a Permanent Institution, When the Problems of Machines Specially Built for the Service, and of Routes and Landing Fields, have been Solved. Here is Seen an Airplane Taking On Mail from a Postal Motor Truck

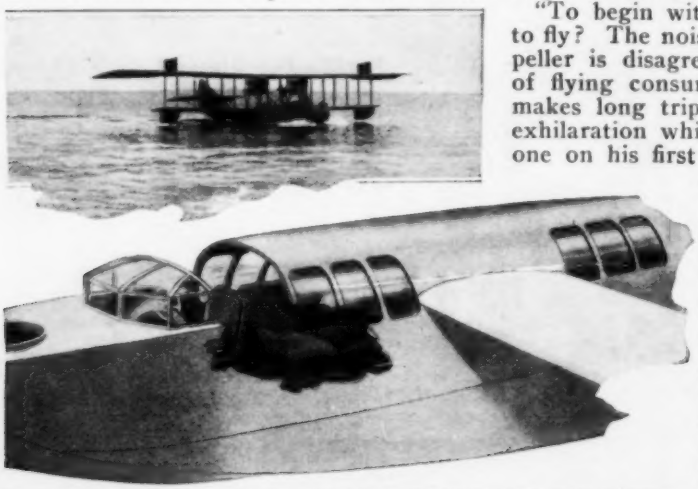
This suggests a number of pertinent questions. What, for instance, are the benefits to be derived by aerial transport? What can air craft do that cannot be done more cheaply and satisfactorily by other mediums of transportation? Can they be considered reliable vehicles, when adverse weather conditions, motor limitations, and a thousand and one other things are involved?

These questions are not difficult to answer. First of all, the aeroplane is king of speed. That, and its ability to travel a straight course between given places and thereby reduce mileage, are its great points of merit. Its commercial success does not depend so much on its ability to handle a large load as it does on the speed with which it delivers a small and important one. As for reliability, we have some interesting statistics compiled by the Division of Aerial Mail Service of the Post Office Department. Mail planes operating between New York, Washington, and Philadelphia during a recent month had 104 scheduled flights, representing a total mileage of 11,336, to make. Only on two occasions were forced land-



The Celebrated Loening Monoplane, a Notable American Achievement of Recent Date, Viewed from the Rear: It Mounts a 300-Horsepower Hispano-Suiza Motor, and in a Government Test, with Three Passengers and Full Load of Fuel and Oil, has Attained a Speed of 150 Miles an Hour, While Its Landing Speed can be Reduced to Only 48 Miles

ings necessitated. One hundred and two nonstop trips, covering 11,118 miles, were completed. And in presenting these figures it is only fair to call attention to the fact that the mail planes now in use cannot strictly be considered the best that can be built at this time.



Above is Shown the New Curtiss Flying Boat "H-16," Which, with a Power Equipment of Two Liberty Motors, Makes 95 Miles an Hour and can Carry a Load of Nearly 1,900 Pounds in Passengers and Crew. It is Designed as a Peace-Time Air Cruiser. Its Passenger Cabin, as Seen Below, is Comfortably Sheltered and Has Ample Window Space for Sight-Seeing. Note Also the Windshield in Front of the Pilot's Seat

In wintertime, the aeroplane is perhaps more dependable than railway trains, for the snowstorms that delay and often block the latter are not likely to interfere seriously with aerial transportation. The aeroplane can rise above any ordinary storm, so that rain, sleet, and snow do not affect it. This disregards, of course, the present hazard of landing in fog or blinding snow. Likewise a cyclone—not often to be encountered—is as dangerous for an aeroplane as it is for anything else that gets in its path.

Grover Cleveland Loening, designer of the famous Loening monoplane, has interesting views regarding the utility of the aeroplane. He is one of the most unprejudiced critics I have found and attacks the question in a straightforward, almost brutally frank, way. Here is what he has to say:

"The commercial possibilities of flying and the means of developing them can be translated into terms of level-headed business because we now have definite knowledge on which to base mature judgment. To be successful commercially, the aeroplane must be made to offer distinct advantages that are not to be obtained by other means, and these must be so great that the disadvantages of expense, danger, and uncertainty are overwhelmingly outweighed. To ignore the limitations we know to exist, is to invite loss of public confidence.

"To begin with, is it really a pleasure to fly? The noise of the engine and propeller is disagreeable. The very nature of flying consumes nervous energy and makes long trips tedious. The buoyant exhilaration which is expected by everyone on his first trip, is absent. No one enjoys being bundled and goggled, and it is not a pleasure to have conversation restricted to the use of phones. On the other hand we have the pleasure of marvelous views and the feeling of mastery. Many of the features of flying which are undeniably disagreeable will be overcome by the provision of closed-in bodies—and these we will find in new types of peace-time aeroplanes. But while some persons find pleasure in merely flying around a field, it is far from proved that this is sufficient in itself to make aviation a great universal sport. Something more than this is needed—a feature of utility that will make the physical phases of flying secondary. Deafening noise, crowded cars, foul air, and blank walls make New York's subways admittedly disagreeable. Yet thousands upon thousands of persons use the subways rather than motor cars because of their great utility—quick, direct transportation.

"To consider another phase: The aeroplane and the motor car are not competitors, for the present at least. The aeroplane, for short hauls, cannot hope to cope with the automobile that can stop at any curbstone. But when distances greater than 50 or 60 miles are involved, the latter vehicle ceases to show great advantage. Right here is where the aeroplane steps in, but as a competitor of railway and boat transportation.

"Undeniably, in terms of miles per hour of actual travel, neither the train nor the ship can approach the air craft. Yet there enters another element that must be considered. It is the time consumption between office and office, we will say, that is important. The office-door interval must include motor-car trips to and from airdromes, which for some time, no doubt,

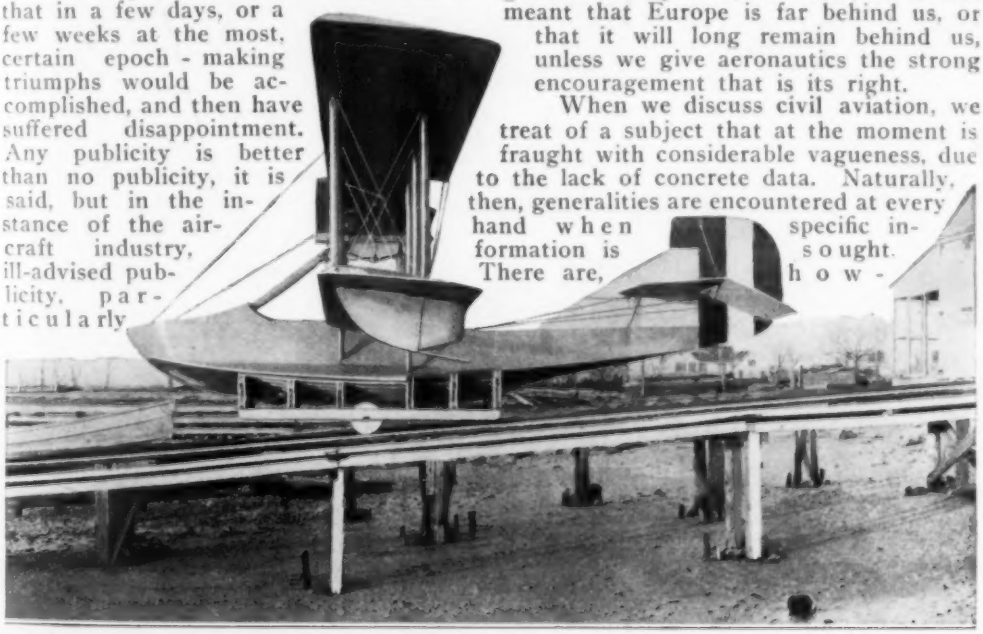
will represent greater distances than taxi rides to and from railway stations. Thus at once commercial aviation faces a curious situation—the speed of travel by air is more important now than it will be in years to come. It is needed at the outset to give aerial transportation a sound utility so advantageous that people will ride in the aeroplane, not because of novelty or sensation, but because it is so overwhelmingly the fastest and most direct means of transportation that the elements of high cost and danger are wholly discounted. When we can offer this, a commercial era as great as railroading will unfold itself."

There is one thing that the public and particularly business men upon whose support commercial aviation depends, should know, even though it bares the family skeleton in the closet of America's aeronautical chambers. The desire for personal publicity in circles really outside of the industry itself, has been a serious menace. The public has been grossly misled and has gained exceedingly unfortunate ideas of aviation. Again and again encouragement has been given, in what the public has believed to be "high circles," to rainbow projects utterly impossible of accomplishment at the time, and known to be so by those fostering them. People have been led to believe that in a few days, or a few weeks at the most, certain epoch-making triumphs would be accomplished, and then have suffered disappointment. Any publicity is better than no publicity, it is said, but in the instance of the aircraft industry, ill-advised publicity, particularly before the war, but even now in evidence, has created the popular impression that aviation is a "flighty" thing and that commercial aviation is indeed highly visionary. Men like Orville Wright, Grover Cleveland Loening, Harold Talbott, Jr., Chance Vought, and others of similar high standing, are unanimous in their condemnation of the practice, and most cognizant of the great injury it has worked.

Mr. Wright, who is renowned for his conservatism, feels that the public has grown to overestimate both the danger of flying and the abilities of modern aeroplanes. On the other hand, Mr. Loening believes that thinking people have so long been fooled that they now really underestimate the capacity of flying craft.

There is still another angle that is interesting. Censorship, on the one side, and foreign propaganda, on the other, have made it appear that Europe, and especially England and Italy, possesses the greatest air craft in existence. Nothing could be farther from the truth. In bombing, fighting, and training planes, American-designed, motored, and built, we have the superlative in present-day achievement, and at least the foundation on which to build passenger and freight-carrying ships of equal, if not superior, greatness. By this, however, it is not meant that Europe is far behind us, or that it will long remain behind us, unless we give aeronautics the strong encouragement that is its right.

When we discuss civil aviation, we treat of a subject that at the moment is fraught with considerable vagueness, due to the lack of concrete data. Naturally, then, generalities are encountered at every hand when specific information is sought. There are, however,



Isolated Instances of the Use of Aeroplanes and Flying Boats for Sporting Purposes have Come to Notice Now and Then in the Past. Here, However, Is a Craft Specially Designed for the Sportsman. It Is the Curtiss Flying Boat "MF," Built for Two, and Has a Speed of a Mile a Minute

ever, a number of elements which form a substantial basis for reasoning. After all, one could hope for no more at this time than the opinions of reliable authorities.

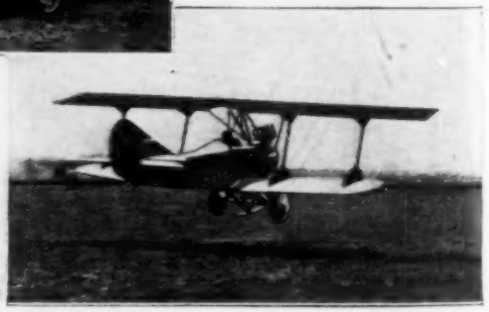
One thing that has an immediate and important bearing on civil aerial transport is the landing station. Before aviation can reach any noteworthy state of peace-time development, airdromes are needed. Although we have planes that travel at thrice the speed of railway trains, their usefulness is limited by the lack of proper landing facilities. Moreover, safety is likewise involved. Orville Wright, whose opinion is shared by others, contends that aeroplanes must either have a very low landing speed—say, 20 or 25 miles an hour—or there must be frequent alighting places provided for them. With both low landing speed and frequent well-constructed landing fields, of course, we would approach the ideal condition. But in America, at the present time, we have neither of these advantages, although it is true that our engineers are getting wider speed ranges than ever before and, therefore, lower landing speeds than have been common in fast machines.

The country as a whole seems to be awakening to the importance of establishing airdromes, and commendable activity is being shown. Towns, for instance, that one has never heard of before, are inquiring what they should do. And when a moment's thought is given to the subject, it is not surprising that out-of-the-way points, extremely desirous of better lines of communication with the outside world, should be among the first to encourage development of the aerial transport. The difficulty, however, is that so far the "commendable activity" has produced few concrete results—that is, actual fields.

In speaking of landing fields, Mr. Wright, in brief, says: "To make flying perfectly safe, good landing fields should be established at 10 or 15-mile intervals. When this is done, the greatest obstacle in the path of aviation will have been overcome. Flying at a height of a mile, one can glide six or eight miles in any direction without power. Thus, when there are frequent, well-marked landing fields, motor trouble necessitating a forced landing will occasion no peril. And I might say that the aeroplane of today is an abundantly safe vehicle.

"Because of the great expense involved in the establishment and maintenance of fields, adequate in number, size, and condition for widespread flying, it seems that aeroplanes must be built for existing conditions rather than for ideal ones. Take, for example, the motor car. It became a practicable vehicle of great utility when it was built to negotiate whatever sort of roads were to be encountered. Its universal adoption has forced the construction of better highways, until today in every part of the United States, the good-road issue is a live one. The same condition governs the aeroplane. It must be built to alight safely wherever there is an open space. With its increasing use will come airdromes and the desirable emergency-landing fields."

The Division of Military Aeronautics, in response to the flood of inquiries emanating from towns and cities, has issued the following memorandum, which briefly describes how a landing field should be constructed in order to encourage civil aerial transport.



Two Views of a New American Biplane, Designed for Civilian Use, That is Expected to be Sold through Motor-Car Dealers for $2,500: Strictly, However, It Is Still in an Experimental Stage at Least So Far as the Public is Concerned and Has Yet to Prove Its Worth

"The landing field should, if possible, be from 1,500 to 2,000 ft. on a side. This would afford a four-way field permitting landing from any direction. If there are no high obstacles along the borders, such as buildings, trees, wires, etc., a somewhat smaller field could be used, possibly as small as 1,200 feet square. Consideration should also be given as to whether or not building construction in the future may encroach upon the approaches to the field.

"The soil should, if possible, be light and porous, with natural drainage. The surface should be level and smooth, covered by a firm sod. It is especially important that the nature of the soil should not be such as to become soft in wet weather.

"The location should be near transportation facilities, such as good roads, car lines, etc.; the closer to the center of town, the better.

"The field should be marked conspicuously so that it can be easily located from the air. A large whitewashed circle, with a letter in the center, designating the name of the town, is a suggestion along that line.

"Instructions should be posted at the field indicating proper steps to be taken to obtain high-test gasoline and oil most expeditiously. It is most important that high-test airplane gasoline be obtainable. These instructions should also give information covering possible arrangements for guarding machines.

"At the present time these fields must necessarily be a municipal proposition, since there is no authority to cover government support or regulation. As regards mechanical equipment, eventually hangars and gas and oil stations, and possibly a rest house for airmen, would be very desirable, but, due to the present status of aviation development, it is not thought advisable to start any such elaborate program, unless the field concerned were on a regularly established aerial route."

The Picture Above Gives a Side View of the "Bluebird," and Well Illustrates the Position of the Landing Chassis When the Craft Is in Flight. In One Respect the Photograph Is Deceiving: The Plane Is Not as High as a Fair-Sized Man

The Attempt to Evolve a Cheap Plane of Low Operating Cost for Sporting Purposes Is an Interesting Step, but That Is All That can be Said for It at This Time. Here Is a $2,000 Craft That Weighs Only 350 Pounds and Has Some Odd Characteristics. The Lower Wing Span Is Greater Than the Upper, the Landing Chassis may be Drawn into the Body, and the "K"-Bracing Is Distinctive. The Latter Two Features Are Attempts to Reduce Resistance

Carrying the question of landing fields, which is a vital one, a step farther, two opinions are expressed. On one hand it .s believed that the extension of the aerial mail service will rapidly solve the problem; on the other, that the enterprise should immediately be undertaken by municipalities and individuals, with the assistance of the air-craft industry, and not left to the Federal government.

Night flying will be necessary for the successful prosecution of commercial conquest, and for that reason provision must be made for clearly marking air ports so as to permit safe descent in the dark. Another consideration is the development of some practical means of indicating the positions of alighting stages when they are hidden from view by fog, and of lessening the danger of landing at such times. Star rockets were used during the

war for this purpose, and until some better means is devised, they offer a little—although not very encouraging—aid.

Glenn Curtiss, one of the well-known pioneers in American aeronautics, seems firm in the belief that one of the first important developments in commercial aviation will be the use of flying boats and seaplanes for passenger and package-carrying between ocean and lake ports, for the reason that sheltered harbors offer the only "landing fields" that are necessary. In other words, terminal facilities for the flying boat are already provided.

Concerning the use of "land" machines, he cites the provision of airdromes as prerequisite, although at the same time pointing out that in certain parts of the middle West, South, and Pacific-coast regions one can alight almost anywhere without serious difficulty.

"I look for the early development of mail routes, the use of aeroplanes for coast-guard patrol, forest survey, life-saving, harbor patrol, and general passenger and freight carrying," Mr. Curtiss asserts. "It probably will be two or three years before commercial aviation will be developed sufficiently for the industry to stand on its own feet, however."

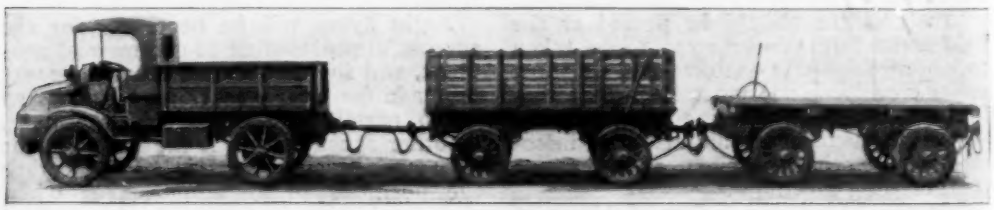
And this introduces the reason that many men in the industry—among them Harry Bowers Mingle, president of the Standard Aircraft Corporation; Glenn L. Martin, Chance M. Vought, and others—feel that government subsidy, or at least Federal coöperative support of the thoroughgoing sort, should be extended at this time to carry aviation successfully through the transition period it is now entering. In establishing civil aerial transport, the problem is not greatly unlike that of projecting a modern railway line through new, undeveloped country sparsely settled with people who have previously depended on other and slower mediums of transportation and at the outset are slow to accept an innovation and use it. Every one agrees that the public has yet to be converted to aviation.

(To be continued)

AIR BRAKES FOR TRUCK-AND-TRAILER TRAINS

So long as the truck and trailer are operated at eight or ten miles per hour on good roads and in level country, the necessity of air brakes or, in fact, any brakes, on the trailer is not great. But when powerful engines are used in the truck so as to pull a trailer train over the mountains of Pennsylvania, grades are encountered which require the use of brakes on the trailers as well as on the truck. If, in addition, the trucks and trailers are provided with giant pneumatic tires, it is possible to operate the trucks at higher speeds than is customary. Twenty-five miles per hour is a good average road speed for such a train. As compared with speeds mentioned above, from six to nine times as much work has to be done by the brakes in stopping a truck running at 25 miles per hour. It is obvious that the brakes provided on the truck are not equal to such an overload and additional brakes are necessary.

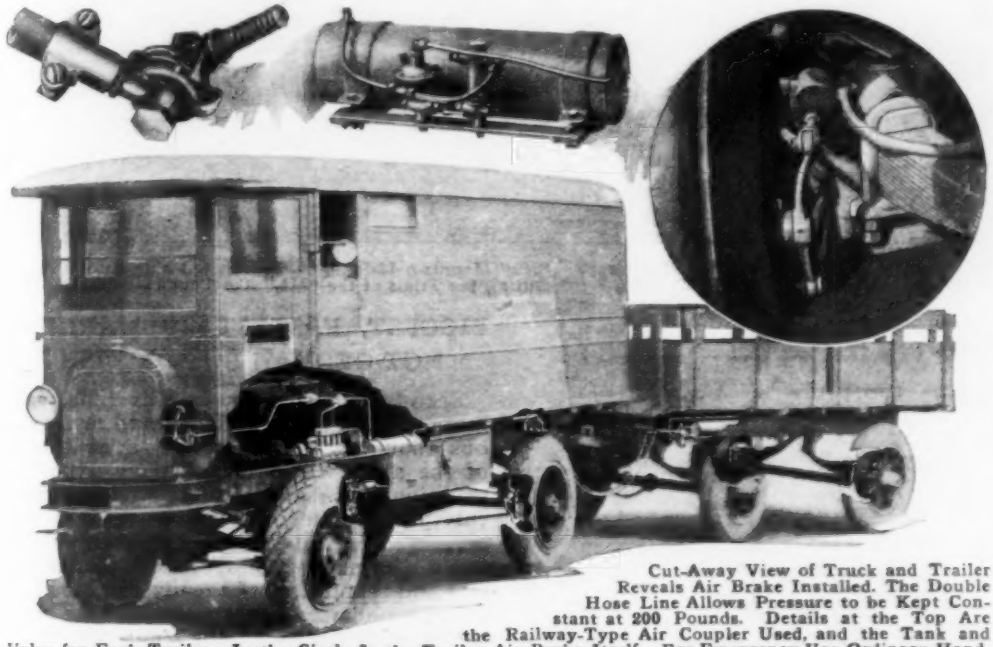
Not only must additional brakes be provided, but, unless the brakes on the trailers are applied simultaneously, there is going to be dangerous skidding of the trailers. On a greasy pavement, or a hill, the trailer will try to whip sidewise and pass the truck that is towing it, if the speed of the latter is reduced by the application of brakes. As a universally jointed drawbar has to be provided between the trailer and the truck, it is obvious that such a bar will not prevent the trailer from whipping or skidding if the resisting force is applied at its end. It would be just like trying to balance a 10-ton load on the end of a broomstick. Although the use of brakes on the trailer is granted,



Truck-and-Trailer Train Equipped with Air Brakes: The Double Air-Line Connections of Rubber Hose Are Visible between the Vehicles. So Equipped, and with Large Pneumatic Tires on the Trailers, a Train can Average 25 Miles an Hour in Hilly Country

the method of operating them is a problem.

Air brakes have been tried out during the past year, and in the form which they now have, are very practical and satisfactory. Using air brakes gives a very satisfactory and flexible means of connecting up the towing truck with the trailers, as only a few pieces of hose are necessary.



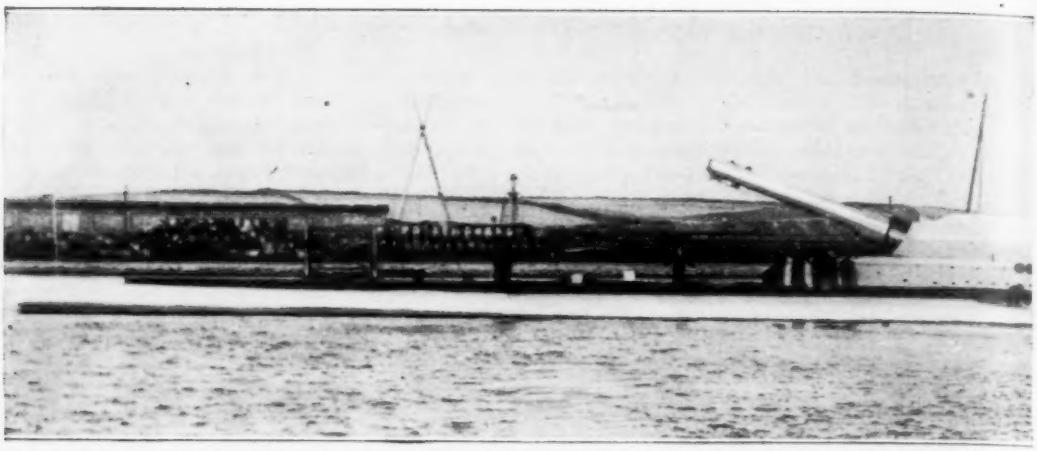
Cut-Away View of Truck and Trailer Reveals Air Brake Installed. The Double Hose Line Allows Pressure to be Kept Constant at 200 Pounds. Details at the Top Are the Railway-Type Air Coupler Used, and the Tank and Valve for Each Trailer. In the Circle Is the Trailer Air Brake Itself. For Emergency Use Ordinary Hand-Operated Brakes Are Also Provided

The system herein described consists of the following units: A power-driven air pump which is disconnected as soon as the system reaches 200-lb. air pressure per square inch; an air reservoir on the truck, and one on each of the trailers; a pedal-operated brake valve beside the foot throttle on the truck; a pressure-regulating valve on each of the trailer tanks and an application valve also; the brake cylinders, one of which is applied to each brake, and the two rubber-tube air lines that extend from the truck to each of the trailers.

Two air lines are provided so that one may be utilized to keep the air pressure in each of the trailer reservoirs at the prescribed 200 lb., and the other to regulate the application of the air pressure in the brake cylinders.

The application is regulated by the position of the foot pedal. The farther the pedal is depressed, the greater the pressure applied on the brakes, and this is maintained until the pressure of the foot is removed from the pedal. The valve is so constructed that as soon as enough pressure—the amount corresponding to the particular position of the valve—has entered the brake cylinders, the admission of further air is automatically cut off without any action or thought on the driver's part. Further depression of the pedal and movement of the valve increases the air pressure in the brake cylinders, and vice versa. This feature, and the use of the double air line, are the most prominent characteristics of the system. One other, however, should be mentioned, the provision to apply the brakes whenever the air lines are broken. Should the trailer hitch break loose on a hill, the brakes would be applied instantly so that there would be no chance of the trailer running amuck. Manually operated brake levers and connections, which in no way interfere with the operation of the air brakes, are also provided.

¶ Daylight-saving day's first anniversary falls on Sunday, March 30, 1919, and all the clocks in the country will be set forward one hour, just as they were last year. They will be set back on Sunday, October 26, unless Congress acts to repeal the measure.



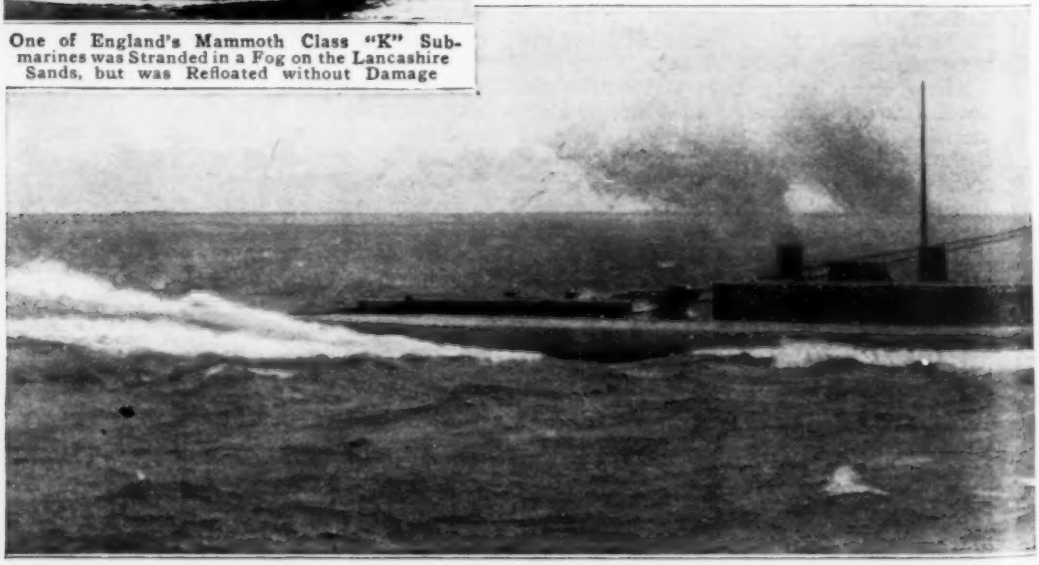
"M1" Mounts a 12-Inch, 50-Ton Gun, Firing an 850-Pound Shell During the Trials of the "M1," the Sound of Its Big Gun Was

The British Navy's Submersible Monitor Tons and Fired a Shell of 100 Pounds.

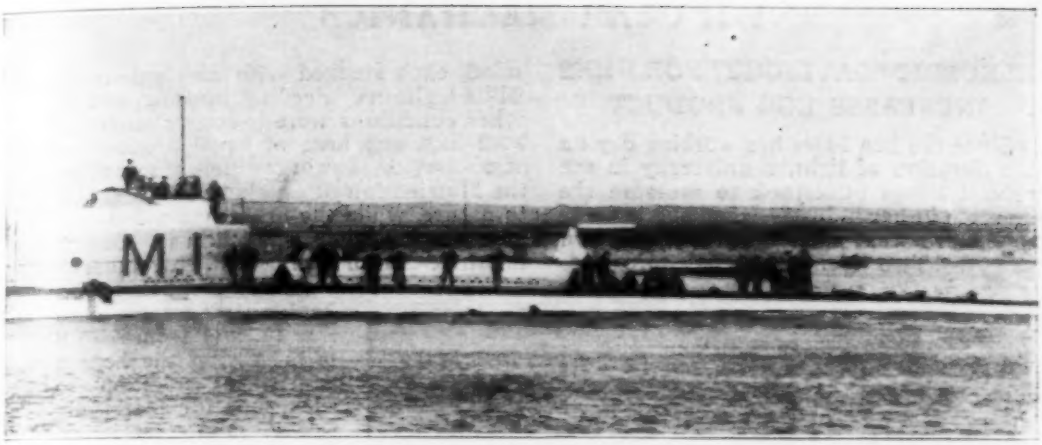
One of England's Mammoth Class "K" Submarines was Stranded in a Fog on the Lancashire Sands, but was Refloated without Damage

BIGGEST, FASTEST SUBMARINES NOT GERMAN BUT BRITISH

Secrets of the navy, in war time, are more curious and wonderful and mysterious than any other secrets, even those of the army. The British navy, true to tradition, had many of these well-guarded enterprises, some of which it is now permitted to view. So it transpires that while Germany monopolized submarine talk and reputation, the really biggest and swiftest undersea boats were built by and belonged to Great Britain. The performance of these craft, known as class "K," is typified by the "K1," which has a surface speed of 24 miles an hour and a



"K1," of the British Navy's New Submarines, the Largest Ever Built by Any Nation: On the Surface It Makes 10 Miles an Hour. It Is 340 Feet Long, with a Displacement of Four-Inch Guns, Fore and Aft, Three Anti-Aircraft

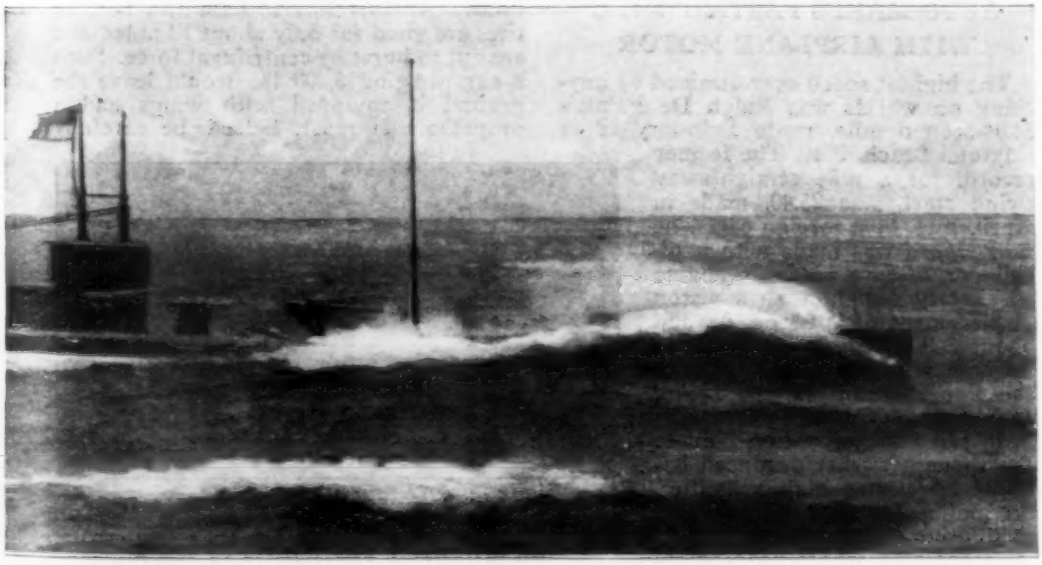


While the Largest Armament Carried by Any German Submarine Was a Six-Inch Gun, Which Weighed But Five Responsible for the Rumor, Prevalent Ashore, That the Isle of Wight was being Bombarded by German Battleships

submerged speed of 10 miles. It is 340 ft. long, with a 2,000-ton displacement on the surface and nearly 3,000 as a diver. Two four-inch guns fore and aft, three anti-aircraft guns, and eight torpedo tubes constitute its armament. On the surface it raises two short funnels out of a deck recess and runs on steam from light water-tube boilers. Submerged, it is electrically driven. The British navy's "M" class is a remarkable type of submersible monitor, armed with a 12-in., 50-ton gun, firing an 850-lb. shell. Both these ships are away beyond anything in submarines attempted by the German navy, and are competent to meet enemy destroyers or even cruisers.

GAS USED TO EXTINGUISH INSULATING-OIL FIRES

Large central-station transformer cases and switch-gear tanks filled with insulating oil have a certain element of fire risk. A French method of protection proposes to extinguish such fires with nitrogen or carbonic-acid gas. A pipe carrying gas under pressure connects with each oil tank, the end of the pipe being stopped with a fusible plug. Individual gas cylinders for each oil tank may be used. To protect the cable ways from high temperature, hand control is substituted for automatic, the pressure tubes of gas being connected to a large storage tank.



Makes 24 Miles an Hour, Propelled by Steam and Using Oil Fuel. Submerged and Electrically Driven, It About 2,000 and 3,000 Tons, Floating and Diving, Respectively. It Mounts Two Guns Amidships, and Has Eight Torpedo Tubes

ELECTRIC "DAYLIGHT" FOR HENS INCREASES EGG PRODUCT

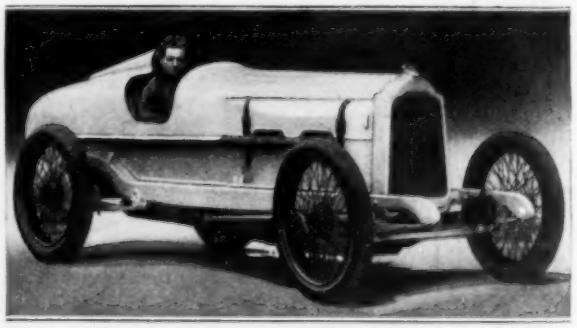
Since the hen bases her working day on the duration of light, a university in the central states undertook to measure the increase in her industry when she is made to believe that the days have grown longer. Two identical pens were provided, each stocked with 35 single-comb white leghorns. Feeding, housing, and all other conditions were exactly similar for both lots, and hens of equal productiveness selected. The only difference was that the illumination of one henhouse was left to nature, while the other had a 100-watt incandescent lamp installed in it. During the three-month trial period, November to January, the lamp was kept burning from 6 to 7 a. m. and from 4 to 8 p. m., giving the hens a 50-per-cent addition to their time for exercising, eating, and "working." From the unlighted pen 1,082 eggs were taken in the three months; the birds which worked overtime by electric light produced 1,478 eggs in the same period. This gain of 33 dozen eggs, at 63 cents, left a net profit of $15.27 on an investment of $5.52 for electric current. Feed cost was practically no higher for the lighted pen, but it took the hens about two weeks to respond to the artificially lengthened working day.

COURTESY PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION

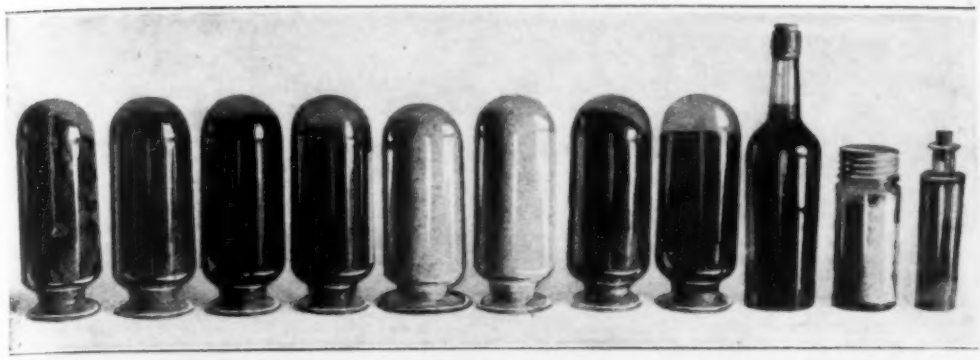
The Henhouse at the Left Has a 100-Watt Lamp Burning from Six to Seven A. M. and from Four to Eight P. M. The One at the Right Has Only Natural Lighting. Hens in the Lighted Pen Laid Nearly 40 Per Cent More Eggs Last Winter Than Their Sisters Next Door

AUTO MAKES FASTEST MILE WITH AIRPLANE MOTOR

The highest speed ever attained by anything on wheels was Ralph De Palma's 24.04-second mile, made February 12 at Daytona Beach, Fla. The former record, for a mile straightaway flying start, was 25.40, made in April, 1911, by a foreign car. The new record was made with a 12-cylinder, V-type air-craft engine of Liberty design, with a piston displacement of 904.8 cu. in. and about 260 hp. Air-craft designing experience was also applied to the construction of the racing car's body, which has a long torpedo tail calculated to eliminate the vacuum pocket produced behind the car at high velocities. Streamline contour was applied to all other salient points, notably the front axle, whose head-on resistance was reduced nearly 100 lb. The figure set means a speed of 149.72 miles an hour. At this terrific rate the best of tires are good for only about 10 miles, and are apt to burst by centrifugal force. Such a car, weiging 3,400 lb., would leave the ground if equipped with wings and a propeller. It must, indeed, be carefully designed to prevent its doing so by its own sheer speed and air surface.



Ralph De Palma's Streamline Racer, with Which He Broke the World's Record for One-Mile Straightaway Flying Start: His Mark of 24.04 Means a Speed of 149.72 Miles an Hour, the Highest Velocity Ever Attained on Wheels



All These Products Come from the Kernels of Apricot Pits. Taken in Order, the Bottles Contain the Pits Themselves, Their Kernels, Apricot Fruit Oil, Bitter Oil of Almonds, Apricot Meal, Apricot Cleanser, American Blue, Prussic Acid, Fruit Oil Ready for the Market, Benzoic Acid, and Essence of Apricot

APRICOT PITS NOW SUPPLY PRODUCTS ONCE IMPORTED

Industrial chemist for the world was a part played by Germany with her usual assurance and air of natural monopoly. One good that is working out of the evil of war is the demonstration that American chemists, under the spur of demand, can readily surpass the accomplishments of German science. California has an annual by-product crop of 7,000 tons of apricot pits, which were formerly sold to Germany and Denmark at $45 a ton. When the war closed this market, and the price dropped to $15, a California chemist bought a supply and started experimenting. He is now able to market apricot fruit oil, a substitute for olive oil; essential oil of apricot, better known as bitter oil of almonds; a meal used in mixture with others for waffles and hot cakes; a finer meal used for cleansing; American blue, formerly known as Prussian blue, from which prussic acid can be made; extract of apricot for flavoring, and a small quantity of benzoic acid. American blue is in large demand for coloring printing inks, paints, etc., and forms the base for a cheap bluing. Bakers' almond paste may be made from the essential oil. The latter has a market value of $10 a pound, while American blue commands $1.65 a pound. A ton of apricot pits yields products valued at over $200.

¶England's old-time institution, the baked-potato man, once more is offering hot sweet potatoes at all hours on London streets. It is said that before the war shortage, chilly pedestrians found a pair of his commodities in the pockets quite effective as finger warmers.

BEE MAN IS NOT TERRIFIED BY BEES IN HIS "BONNET"

While it is well known that experienced bee men do not hesitate to move among and handle bees without special protection of any kind, it is safe to assume that there are comparatively few who would venture to fill a hat with the buzzing creatures and then place the hat on his head, as the veteran bee man shown in the accompanying photograph has often done. It will be observed that the bees are crawling over his clothing and hair in large numbers. This man possesses an enviable immunity to the poison of bee stings, but in order that as few of the insects as possible may sting him, he confuses them by shaking them up badly and giving them a dose of smoke before putting them in his hat.

A Veteran Bee Man Demonstrating That He Has No Fear of Bee Stings: Numbers of the Angry Insects are Flying from His Hat, and Others are Crawling on His Hair and Clothing

FOREIGN PASSENGER-CARRYING AEROPLANES

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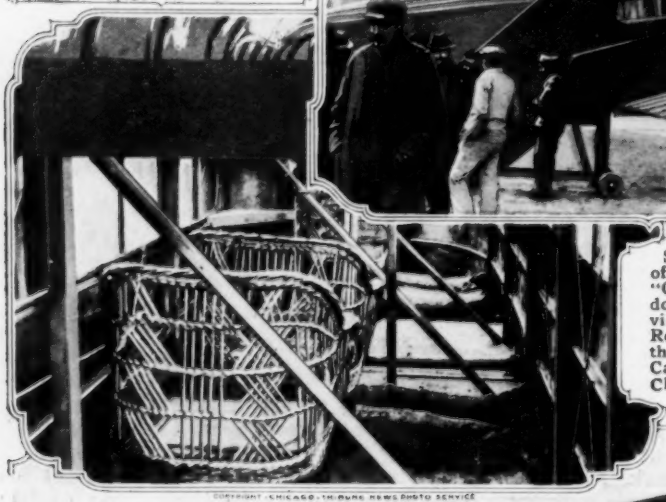
A Glimpse in the 12-Passenger Cabin of the Big Farman Peace-Time Biplane, Pictured at Right and Below



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Showing the Inclosed Body of the Farman Two-Motored "Goliath," Developed for London-to-Paris Passenger Service and Used to Carry British Representatives to and from the Peace Conference: The Cabin is Fitted with Wicker Chairs as Pictured at the Left

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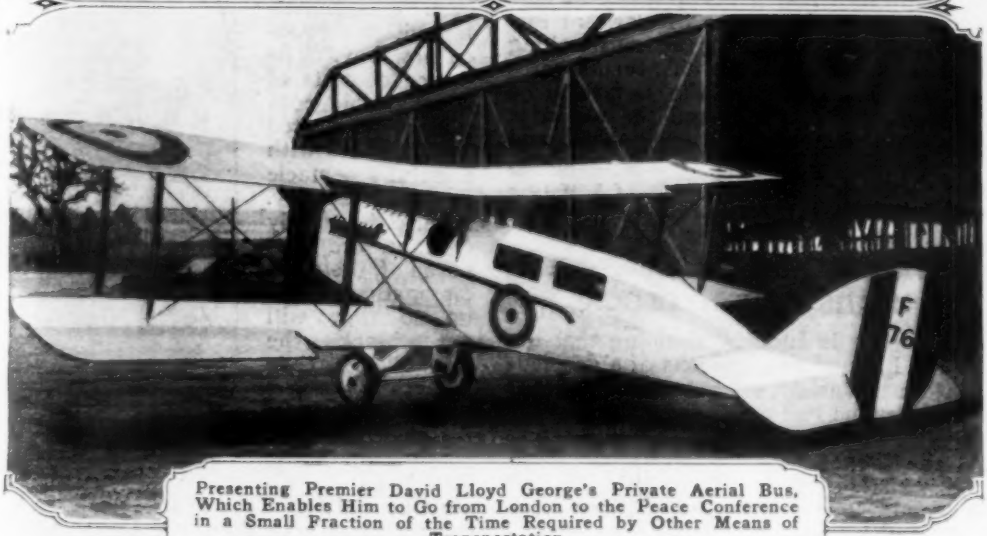
Three-Quarter View of the "Goliath," Interesting as an Example of the Commercial Aeroplane of the Armistice Season: Since This Particular Machine is Apparently Used Only for Official Business, the Word "Commercial" Is Merely a Descriptive Term

INTRODUCE A NEW ERA OF TRANSPORTATION

The Interior of Lloyd George's Inclosed Cross-Channel Aeroplane, with Comfortable, Upholstered Seats for Two, a Writing Table, and a Luggage Compartment Abaft the Pilot's Cockpit

PHOTO BY CENTRAL NEWS PHOTO SERVICE

In the Opinion of Many, Aeroplaning Isn't a Half-Bad Sport, and among Those Who Share the Conviction Is the Duchess of Sutherland, Here Shown in the Gunner's Cockpit of a De Haviland



Presenting Premier David Lloyd George's Private Aerial Bus, Which Enables Him to Go from London to the Peace Conference in a Small Fraction of the Time Required by Other Means of Transportation

FRENCH FLIER MAKES LANDING ON ROOF OF PARIS STORE

Successfully landing his Caudron biplane on the roof of the Galleries Lafayette, a six-story Paris department store, won Jules Vedrines a $5,000 prize and the honor of being first to accomplish such a feat. The size of the roof is about 82 by 46 ft., and the width of the French flier's plane was 39 ft. The space inside the parapet had been cushioned with sandbags during the air-raid period, and the landing was made with only slight damage to the machine and none whatever to the airman. Vedrines' flight was made shortly after the noon hour, and in a fog. From Issy les Molineaux he flew straight over the center of Paris at low altitude, barely skimming the houses along the Rue de la Chaussée d'Antin. Over a bank just across from the Lafayette he stopped his engine, missed the top of a sign on the store by a few inches, and quietly made his remarkable landing. Vedrines, who has a spectacular war record, now wishes to fly around the world.

PHOTO BY CENTRAL NEWS PHOTO SERVICE

On a Department-Store Roof, 82 by 46 Feet, Six Stories above the Ground, the French Airman Jules Vedrines Made a Spectacular and Successful Landing with His Caudron Biplane. Sandbags on the Roof, Relics of Air-Raid Days, Reduced the Shock of Alighting

JEWELER "NATURALIZES" BIRD IN HIS CUCKOO CLOCK

A jeweler in Indiana, deciding that the bird in his cuckoo clock was of a decidedly German variety, set out to "naturalize" it. When he had finished making alterations he set the timepiece to going again. At the proper time the bird came forth and whistled "Bob White, Bob White," in good American fashion. Since then the jeweler has been called on to Americanize several other clocks.

TURN MISSISSIPPI RIVER TO SAVE CITY HARBOR

One of those practical jokes for which the Mississippi River is notorious has been threatening for some time to spoil the harbor at Memphis, Tenn., and leave the city itself high and dry some distance from the stream. The current has created a sand bar, called "Mud Isle," right where the boats used to land, and has deposited sediment in the harbor, while the opposite bank has been washing away, shifting the course of the river. Army engineers are now engaged in undoing the damage by extending a promontory out from an island near the other shore. They have built two mats of willow, one 1,400 ft. and the other 1,000 ft. long, each 100 ft. wide, carefully sewed and interlaced to resist the current. These mats are placed 1,000 ft. apart and fastened with 3,300 piles, driven in clusters to collect all the sediment possible and become permanent land elements. Thus the current will be swung back over Mud Isle and the harbor, and river men say one good high water will clear out all the trouble.

SIMPLE DEVICE FOR SELLING NEWSPAPERS A SUCCESS

Publishers of early morning newspapers in Washington, D. C., have recently been experimenting with a "wooden newsboy." The device consists of a collapsible container supported by three legs with a metal receptacle for the money. After the early editions are disposed of, the owners gather them up so they will not block the sidewalks. While everything is left to the honesty of the customers, the amount of loss is found to be almost negligible. They are also a boon to the newsboy who does not want to get up in time to sell the early editions.

COMMENT AND REVIEW

[These pages were printed February 20, 1919]

DO we want prosperity? The reply seems to be unanimous. Here is one subject on which we are all agreed; employer, employe; man, woman, and child. World conditions are, to all appearances, more favorable to a most wonderful period of prosperity for the United States, for several years to come, than ever confronted any nation in the history of the world.

Do We Want Prosperity?

But, we mustn't spill the beans!

Bankers, alone; manufacturers, alone; labor, alone; nor farmers, nor miners, nor lumbermen, and so on, alone, not even the Government alone, can make prosperity. To insure prosperity, there must be harmonious team work: everyone concerned must do his part.

The world never needed and wanted so many things which are produced by the brainwork and handwork of man, as today. For four years, the former sources of supply have either been dried up, or commodities could not be moved. The shelves in the stores of the world were never so nearly empty. Farm machinery in other lands has been wearing out with little opportunity of replacement. New fields are required which also must have new machinery. So also have the railroads of the world been wearing out, and thousands of other necessities and comforts of life have been used up or exhausted.

So much for export. What about the work to be done here at home? Millions upon millions' worth of industrial buildings, and houses, and depots, and street improvements, and good roads are needed. Then, why doesn't it start?

In the first place, there must be a reorganization and readjustment to get a plant which has been running on war work back to its former line of production. Not only in many instances an actual change in machinery, but in hundreds of cases a final settlement with the Government. This involves a vast amount of work by experienced men, who must count and weigh thousands of items, check bills for cost, inspect, adjust, make allowances, decide disputes, interpret contracts; all this before final settlement and payment can be reached. Under the most favorable conditions, this takes time, for these questions must be settled with justice to both manufacturer and the Government.

Another cause is the unsettled condition of the labor market. Labor has benefited in many ways under war conditions and naturally is reluctant to recede from its high-water mark; nor is it desirable that it should in all respects. But, does labor realize that the permanent conditions of peace cannot maintain all the emergencies of war? Some men can run very fast for a hundred yards, or even a mile; but the best cannot maintain the pace for long, or even do it every day. The horse which wins the race could not do as well on ordinary roads, nor maintain his greatest effort for an hour, much less a day or a month. In order to stop a fire, the fireman smashes costly windows, and chops away doors, and even blows up entire buildings, but we don't do these things every day. It is only an unusual emergency which makes such costly work justifiable. If it were kept up long enough, we finally wouldn't have any houses to live in. We should discriminate between what is warranted to stop a war and what is reasonable day in and day out.

Just now, in the effort to make war conditions of labor and wages permanent, we hear of strikes here, there, and everywhere. Not only in this country, but abroad. The plain truth is, no law of any country, no refusal by large masses of men to work, nothing which man has ever been able to do, or is likely ever to do, can maintain, for any length of time, abnormal conditions. The normal of today can and ought to be, and promises to be, an improvement over the normal of a few years ago. This is something we all desire, and all benefit from, a steady improvement from year to year; but business, as it exists, is powerless to maintain a sudden and supreme effort. The runner, the wrestler, the race horse, all arrived at their maximum through an advancing process, and not in a moment. Business cannot permanently maintain the high-water mark of war-time conditions in peace times any more than the race horse can deliver rural mail at a two-minute clip, six days a week.

It is quite certain that some employes feel that employers could maintain war conditions if they wanted to; but there is an equilibrium of trade, relentless as the law of gravitation, which cannot be disregarded.

At certain points on our seacoast, under stress of storm, the tides rise to unusual heights for a few hours or days, but even Old Ocean himself cannot keep up the high-water mark for 365 days in the year. The ship which tried to anchor too near shore on these high tides would soon be left a wreck high and dry on the rocks. The captain who thus lost his ship would be blamed even by the crew and passengers who urged him to do so. Even were the vessel put afloat later, there would still be the needless loss of its services, and all to no good or lasting purpose.

Improvements which can be accomplished gradually often become destructive when demanded in a moment. If every man on every farm in the country struck on July first, they couldn't make the growing corn ripen in a month from planting. If all the doctors, lawyers, workmen, farmers, manufacturers, bankers, business men, teamsters, railroad men, and all the rest, even the editors, should quit all effort for a month, they could create a condition of awful chaos, but they could not change natural laws.

Every boy would like to be a man tomorrow, but it can't be done; it takes time to make a man out of a boy; always has, always will. We can all remember when the hours and conditions and pay, for everybody, were very arduous. I haven't forgotten the time when, as a boy, I worked 16 hours a day for $4 a week, and it was the going rate of wages, too. Nobody has to do that now, thank goodness. Normal conditions, as compared with 40, 30, 20, 10 years ago, are immeasurably improved, but it has taken time. The jump from 40 years ago to the present couldn't have been made in a day, or month, or year, no matter how many of us struck. There has been a grand improvement, however, don't let us forget that, and there are due to be more improvements in the years immediately to come; but while waiting for the better and still better things, is it really wise to be too impatient in our haste to reach the goal? Instead of trying to sail the ship ashore on a storm tide, isn't it better to dredge a channel inshore, to reach the same point?

The old-time employer, too many of him, was regardless and thoughtless of his workers. The employer of today, as a class, is a very different type of man. There is a great deal he can yet do, and—in spite of the poison counsel of Bolsheviki—which he heartily wants to do, and will, given time. He, too, has his troubles and finds it impossible to make a five or ten-year advance in a day, but he is speeding up all the time. He is in the midst of a reorganization brought about by the war, and the most of him is conscientiously doing the best he can, or knows how; probably few of all his several thousand employes, if given his job, could do any better.

Would it not, then, seem the fair, the loyal, the sensible thing to coöperate with him to the fullest extent instead of demanding war-time conditions or better, just at this critical moment; or even going on strike in the effort to secure that which, however desirable, may be most difficult or even impossible to grant while the country is trying to get under way again?

Again we suggest, don't spill the beans.

The Seattle Strike

SINCE the above was written, the Seattle strike has occurred. This strike was unique as being the first sympathetic strike in which all the industrial workers in a large city quit work to enforce the demands of one industry which had been out on strike some days without securing its demands. The original strikers, those who demanded higher wages, were employed in the shipbuilding yards.

This demand was that the $4.50 a day rate be raised to $6; the $6 men to $7, and the $7 men to $8. When I visited these yards last July, the $4.50 work consisted of unskilled labor, such as moving a few pounds of bolts in a wheelbarrow, etc., and at that time was largely performed by boys of high-school age. The really skilled artisans, with some overtime, were earning as high as $30 per day.

The total number of workmen in the Seattle shipyards at the time of the strike was about 21,000. The total number employed in shipyards and boat-building plants, combined, in the entire United States at the time of the last census was only 40,506. Shipbuilding in this country did not begin to "awake" until the spring of 1917.

From whence, then, did the shipyard men of Seattle come? Some were trained artisans, but the large majority were miners from Alaska, men from small repair shops, clerks or proprietors of small stores, such as jewelry, candy, dry-goods, and similar stores in Washington, Oregon, Montana, and Idaho, most of whom saw a ship for the first time when they entered the Seattle shipyards where they earned more in one week than in a whole month at home. In view of the fact that the Government shipbuilding program since the armistice was signed lost all its emergency aspects, and is being conducted largely as a matter of honor and with the certain prospect of enormous loss, the demand of the Seattle strikers was at least a bit unreasonable and selfish. It certainly does not add any new luster to the fine record of the preceding 12 months. There really is no reason why the taxpayers of the country, already facing enormous war bills, should in peace times be required to pay more than the already highest wages paid shipbuilders in the history of the world, and which had been justified at the time, as a war measure. However, the strikers apparently thought only of themselves, and had no regard for either conditions or the ability of the country to pay. Having failed in their demands, their leaders proceeded to enlist the help of all other workers in the city, which is a good deal as if you should stop eating because I demand a higher grade of coffee, even though the coffee I now drink is perfectly good and better than I ever had in all my life. It is not a demand based on reason or argument, or in any way logical, but merely an attempt to force a condition by might, which is the very thing we have been fighting the Huns for. No one can imagine the Hun attempt at world domination had any element of benefit to the rest of the world; on the contrary, theirs was essentially a selfish motive, and also equally impossible if the world was to continue with any degree of well-being.

Such a sympathetic strike is in its nature unfair and unreasonable, just as much as a sympathetic lockout, in which every employer of labor in a city would be unfair and even cruel, to combine and close every avenue of employment, to help some other employer reduce his payroll. The Seattle episode reflects no credit on labor unions, nor is it likely that the more intelligent members approved of it, even though forced to take part.

A great many employes believe, many doubtless conscientiously, that they, or a combination of them, could conduct the industry of which they are a part, better than, or at least as well as, the "old man." So far as I know, all such efforts, and there have been not a few, have absolutely failed. The most of us can work more successfully for some one else than for ourselves. The labor unions themselves recognize this, for they will not permit their members to take any chance, nor allow the wages paid to be conditioned wholly on the larger or smaller volume of profits the plant in which they work may make in any one year. The effort at coercion in years past has not been entirely on either side, but now that a better realization of the rights of labor has come to be appreciated and adopted, cannot labor best promote its own well-being by an effort to better understand the conditions which surround the employer, many of which are beyond his control?

I. W. W. and Bolsheviki

A FEW days ago, there passed through Chicago a motley collection of much-bewhiskered gentry, whom the secret-service men had acquired on the Pacific coast and who were en route to Ellis Island, preparatory to leaving the country forever. The guests of this personally conducted tour proudly claimed to be I. W. W.'s. While guilty of several things, it would be impossible to convict any one of them of contributing to the Red Cross fund and other similar objects, or of buying any Liberty bonds, or W. S. S. The charge of any suspicion of having tried to earn an honest living, or contributing in any manner to the welfare of the community, does not rest against them. Their acts are all negative and destructive.

It is possible that a genius like Marconi, if he could bring the sun down and use it in a massive X-ray machine and turn it loose on this bunch of trouble makers, might be able to discover that one or two were only I. W. W.'s and not Bolsheviki. But, to the average man, it is impossible to see any difference. They are eminently and decidedly "undesirable citizens." Their deportation then, under conditions which make it hopeless for them ever again to enter this country, is something which should give intense satisfaction no matter how high

or humble one's position in life. If there is any who think otherwise, he or they will bear watching.

However discontented one may be with his lot, it is inconceivable that he should see any hope or relief in the teachings and workings of Bolshevism, which chops down the tree to get an apple. Even in Russia, the man who casts his lot with them is mercilessly tortured or assassinated tomorrow. There is nothing, absolutely nothing, with which to forecast their action, for they have no plan except that of wanton destruction, in the performance of which they live from day to day on the spoils of the moment. Their announced purpose that "the whole world should be burned over" carries not one word of hope for any better condition to arise from the ashes. And they have none.

It, therefore, behooves every man who believes in an honest life, or has ever so small a room with wife or children, or owns even a few pieces of cheap furniture, or a house, to set his face resolutely against anything and everything which bears the taint of Bolshevism. From the days of earliest history until the present moment, of all the strange and unnatural revolutions which have occurred, none save Bolshevism but has had some purpose to achieve, which at least claimed to improve conditions for the few or many. Some of these were sincere, though mistaken, some well founded, many impossible; yet they all had some goal which held out the hope and chance of something better. Even Captain Kidd's bloody pirates slaughtered and robbed to secure an ultimate life of ease and plenty for the captain and crew, where they could live in peace. If one Bolshevist has more today than another, it is the ethics of the clan that the other kill him tomorrow and take it himself.

The sooner, and to the utmost extent then, that such be searched out, and seized, and deported, the better; and while the deporting is good let us hope a Government which has had its hands more than full with a gigantic war, may now find time and ships to include every alien who is not in sympathy with our flag and a free country. As anxious as our boys in France are to get back home, we venture they would willingly postpone their voyage a trip or two, if that were necessary, to provide ships to carry these crazy inhumans out of the country. Among our insular possessions there surely must be some tropic island which nobody wants that would furnish a good place for exile. There, with some garden tools and seeds, a few thousand of these ill-omened birds of a feather could have a grand time communing with one another like a lot of snakes in a dry well.

Have a Motive

HAVE a definite motive in view as a reward for your saving, and the process will become ever so much more interesting. Mere saving, however commendable, often lacks zest, just as exercising with dumb-bells does not compare with the same effort of sawing wood, gardening, painting the fence or house. There may be an equal amount of exercise in both, but somehow there is a certain satisfaction in an effort which is visualized, that produces something one can see with his eyes.

Booker Washington worked on this plan. He took advantage of the dream of most colored people to possess a piano, to urge them to work and save to buy one. On first thought, there would seem to be ever so many things far more essential to a negro cabin than a piano, but the trouble was, while these things were indeed greatly needed, the desire was not always strong enough to prompt and hold the effort to secure them. His theory was to save for the purpose of securing something definite, with less regard for whatever that might be. For, to save, one must work; and when the working habit and saving habit once bears results, the process perpetuates itself, for there are always still more things to desire and attain.

Select some definite object, then, be it a course of study, a bit of real estate, a house, or whatever most appeals to the individual. Saving then becomes interesting, just as it did when, as boys, we saved pennies to buy firecrackers on the Fourth, or to go to the circus; and as an easy means to this end Victory bonds especially lend themselves.

Keep On Saving

IT would be unfortunate if the saving habit which was so wonderfully developed during the war should be allowed to lapse, now the war fever has abated. As a matter of fact, there is every need that we continue to save, for the treasury requirements are still colossal. It will surprise many to learn that the cost of running the Army and Navy departments alone at the present time is $50,000,000 a day, or a billion and a half per month; 18 billion for 12 months. However, if it will only result in a condition of permanent peace, no one will regret the outlay, and in any event the sooner we pay our bills, the better. The W. S. S. is still doing business at the same old stands.

Gas Masks for Miners

GREAT advance has been made over the old systems of ventilating and lighting the mines of this country, especially the coal mines; and fortunately the terrible mine disasters of a few years ago are much less frequent. The Bureau of Mines is now at work to perfect a gas mask especially for the use of miners, and out of the inventions and developments of the war will doubtless perfect something which will still further protect the miner.

A suitable gas mask will probably soon be included in the compulsory outfit of every man entering a mine, so as to be always available at an instant's notice. The sight of the miner going into a mine with a gas mask hanging from his belt may soon become as common a sight as was that of soldiers carrying masks when they entered the front-line trenches.

A Real Mayor

WHEN the labor unions of Seattle lost their heads and heedlessly precipitated the universal strike, it was most fortunate for all their members that the city had a clear-headed man as its chief. No one can suspect him of leaning toward the employers, for he himself knows from long experience what it is to work with his hands. Moreover, it was these same labor unions who made him their candidate and who voted for him, presumably to a man.

A city can no more continue, even for a few days, with all its functions at a standstill, than the individual can exist with a cessation of his bodily functions. Had the sympathetic strike lasted a week, it would have set Seattle back 25 years in its progress, and just at a time when it is forging ahead as few cities anywhere have ever done. An entire city can conceivably give itself up to a holiday in which few do any work; and it can rest from most of its labors one day in seven. Both are natural and helpful; but to abandon all effort for any length of time is suicidal. Moreover, when all workers become idlers, idleness speedily drifts into disorder; and disorder breeds passion, and passion anarchy. The progressive movement is inevitable.

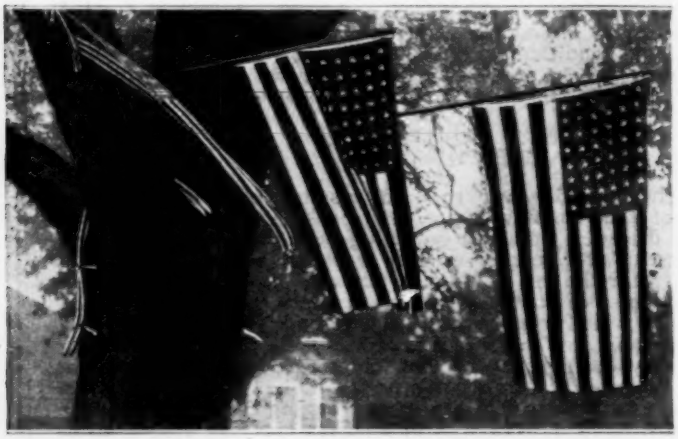
Ole Hanson, Mayor, realized all this, and set forth his proclamation in terms "written so you can understand it." He did it promptly, fearlessly, and determinedly. And in this action he did more for Seattle and its citizens than any other man ever did or is likely to do.

The unions of Seattle might profitably rid themselves of some few leaders of Bolshevist tendencies, and then join with other citizens in erecting a large bronze statue of Ole Hanson, Mayor, and set it up where they can see it every day.

H. H. WINDSOR

FAMOUS TREE A MONUMENT TO HEROES OF TWO WARS

In 1861, when the little unpleasantness between the North and the South broke out, Wyman J. Johnson, of Waterloo, N. Y., came in from the fields one day, hung his scythe in a tree, and said to his parents: "I am going to enlist in the Union army; let the scythe hang there until I return." Johnson, after serving three years, died of wounds in 1864, and, in accordance with his request, his scythe was never taken down and it still is in the tree, a fitting memorial to one who gave his life for his country. Early in 1918, two brothers, Raymond and Lynn Schaffer, on departing to join the American army and navy, respectively, also hung their scythes in this tree. In memory of Johnson, and in honor of the Schaffer brothers, three flags are kept continually floating over the three scythes.



The Famous "Scythe Tree," of Waterloo, New York: The Protruding Blade of Johnson's Scythe, Hanging There Since the Civil War, can Just be Seen on the Right Side of the Tree

SUBMERGED ORCHESTRA LEADER WORKS WITH PERISCOPE

Without any dialogue to guide him, the orchestra director of a New York pantomime's first night found it practically impossible, from his position far below the footlights, to follow the action. The theater management solved the problem by installing a periscope with its eyepiece at the director's stand. Through this instrument of erstwhile evil fame, he was able peacefully to view the whole stage, much to the edification of the observant audience.

MONTHLY WEIGHT CARDS KEEP CHECK ON CHILD'S GROWTH

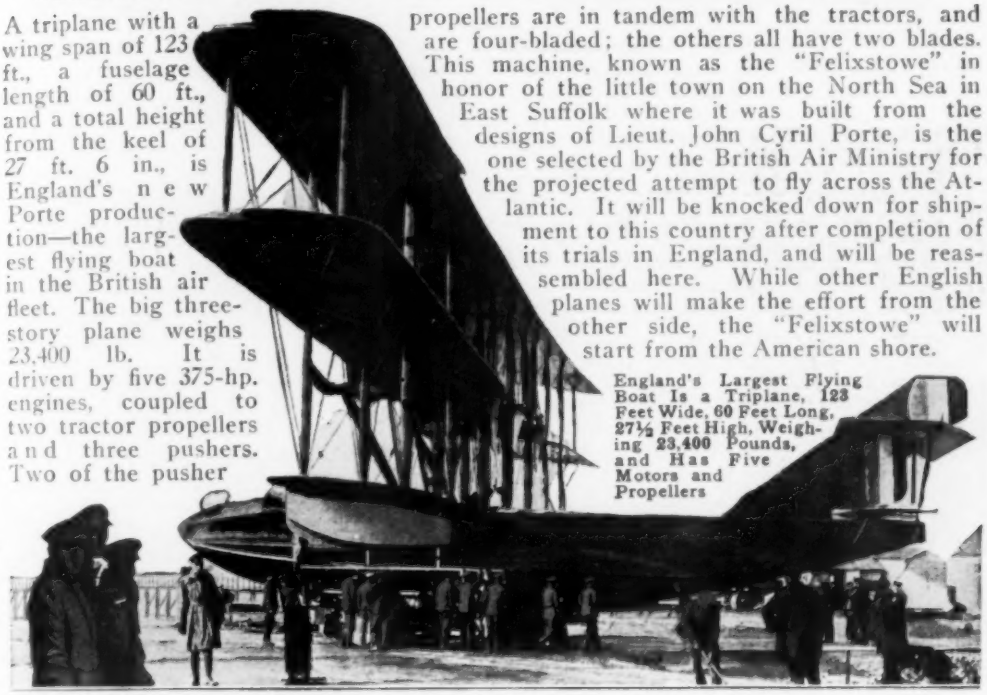
Based on the children's individual characteristics, experts have figured out just how much and what kind of food a growing child should have, and just how it should be prepared. The big problem, however, has been to get this information into the different homes. Penny lunches, scientifically selected and prepared, have been established in many schools, and while they cannot offset the malnutrition often encountered from improper nourishment at home, they are serving as a bridge to carry food instruction to the mothers. Monthly weight charts are kept on every child, and a tag is sent home each month showing just the progress that has been made, and just what its weight should be at that time. This has produced a distinct tendency to bring the home dietary up to the child's level, as that level has been fixed at school.

STOPS AUTOS, GETS TRADE BY "FREE-WATER" SIGN

Few of the many motorists who pass through a little town on the Jackson Highway, halfway between Chicago and Indianapolis, would see any occasion for stopping were it not for a sign at the edge of the sidewalk bearing an invitation to "Fill Your Radiator on Me." Even water as a gift is not to be despised when it is delivered through a hose to a radiator, which by that time probably needs it. The enterprising keeper of the café just across the walk finds that his good-will sign stops many a dollar in trade that otherwise would have whirled on down the road.

TRIPLANE FLYING BOAT IS ENGLAND'S LARGEST

A triplane with a wing span of 123 ft., a fuselage length of 60 ft., and a total height from the keel of 27 ft. 6 in., is England's new Porte production—the largest flying boat in the British air fleet. The big three-story plane weighs 23,400 lb. It is driven by five 375-hp. engines, coupled to two tractor propellers and three pushers. Two of the pusher propellers are in tandem with the tractors, and are four-bladed; the others all have two blades. This machine, known as the "Felixstowe" in honor of the little town on the North Sea in East Suffolk where it was built from the designs of Lieut. John Cyril Porte, is the one selected by the British Air Ministry for the projected attempt to fly across the Atlantic. It will be knocked down for shipment to this country after completion of its trials in England, and will be reassembled here. While other English planes will make the effort from the other side, the "Felixstowe" will start from the American shore.

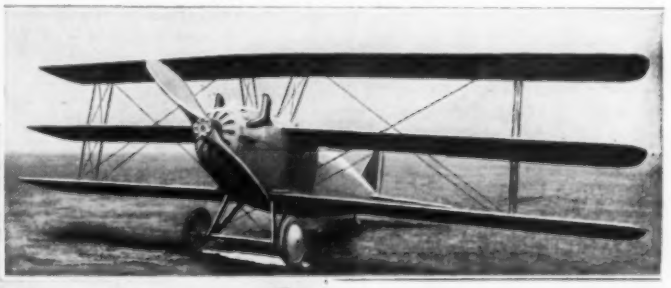


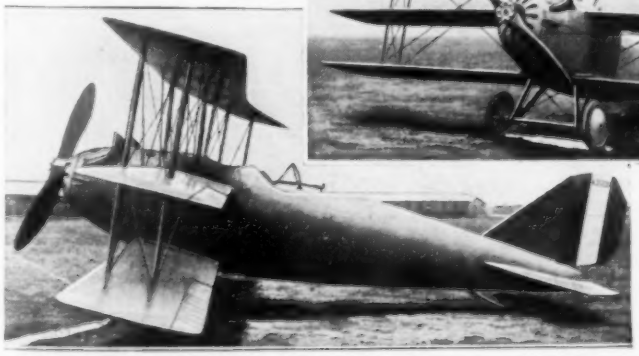
England's Largest Flying Boat Is a Triplane, 123 Feet Wide, 60 Feet Long, 27½ Feet High, Weighing 23,400 Pounds, and Has Five Motors and Propellers

PHOTO BY CENTRAL NEWS PHOTO SERVICE

GREAT SPEED IS ATTAINED BY NEW CURTISS PLANE

One of the interesting military aeroplanes of great speed and American development that may now be discussed, is the Curtiss triplane. In it is an entirely new motor of 400 hp. that is known as the "K-12." It is a 12-cylinder, V-type engine of aluminum construction, with dead weight of 1.86 lb. per rated horsepower. This, and the sharp-nosed monocoque fuselage of the plane, are largely responsible for the great speed, about 160 miles an hour, developed in horizontal flight. All three planes have exactly the same spread, 31 ft. 11 in. The height amounts to practically 10 ft., the over-all length is 23 ft. 3 in., and the depth of the wing chord, 42 in. Empty, the triplane weighs 1,825 lb., and its useful load amounts to 1,076 pounds of fuel, cargo, and passengers.





An Entirely New Aluminum 12-Cylinder V-Type Motor of 400 Horsepower is Installed in This Curtiss Triplane, Which Makes 160 Miles an Hour. It Carries 445 Pounds of Fuel and Oil, and 300 Pounds of Cargo, besides Pilot and Passenger

NEW MONUMENT OF WELCOME TO GREET RETURNING SOLDIERS

As a fitting testimonial to the valor of its soldier sons, and in honor of their homecoming, the Board of Supervisors of San Francisco has turned over an appropriation of $5,000 to the Citizens' Welcome Home Committee to be used in building a monument of welcome. This monument will consist of a column patterned after those of the Parthenon at Athens, and will be 52 ft. high. At the top of the column will be a statue, 12 ft. in height, representing winged Victory crowning the passing heroes with a laurel wreath. The monument is being erected in San Francisco's Civic Center Plaza, and it is proposed to inscribe on the base some of President Wilson's "fourteen points."

JOHN REID, ARCHITECT

SMOKE DISPOSAL ON BRITISH SEAPLANE-CARRYING SHIP

To keep the upper deck of the British seaplane carrier "Argus" entirely clear for the take-off and landing of planes, the customary funnels are dispensed with, and the smoke is discharged through horizontal funnels run under the flight deck to the stern. This rather experimental construction was entirely successful, and, like many other war-time expediencies, suggests a possible peace value for passenger vessels with unobstructed promenade decks. Usually the smoke discharge aft is wholly effective, but for the emergency of contrary winds, side passages are provided. Electric fans shift the smoke columns from stern to thwart. Operating the controllers for the fan motors, automatically turns the drafts into the smoke pipes. Side funnels were less desirable during flights, however, because the hot gases were likely to form air pockets in the path of the airmen.

CLOTH MADE FROM PINEAPPLE FIBER POPULAR IN CHINA

As a dessert, or for use in flavoring extracts, the pineapple is in popular demand, but very few people know that it has other uses. There are several provinces in China, however, in which the pineapple is specially cultivated for the use of the leaves in making cloth. The extraction of the fiber from the leaf is very simple. The green leaves are first soaked in a solution of lime water, after which they are taken out and scraped with a piece of broken glass. The fibers are then pulled out by using the thumb nail and forefinger, and are again soaked in water, washed, and sun-bleached. In order to make thread, the fiber is soaked in fresh water for about a half hour and then split into threads of the desired size, and pulled apart. Two threads are then joined by doubling the small end over the thick end of another thread and rolling over the knee. This process is repeated until the desired length is obtained. It is then run onto bobbins and spools and is ready for weaving. The old native looms are employed entirely for making the cloth, which is widely used for summer clothing.

MOTOR-CAR TIRE GAUGE MADE IN CONVENIENT FORM

One of the season's additions to the list of accessories for the motorist is a pencil-shaped tire-pressure gauge that may be carried conveniently in a vest pocket. The instrument is 4 in. long, ½ in. in diameter, and supplied with a celluloid face that bears the conventional graduations. An internal piston controls the movement of the indicating ring, which consists of a metal sleeve supplied with a small slot, or window, through which readings may be made. To use the gauge, it is only necessary to press its lower end firmly against a tire valve.

It is being urged by government officials that reducing the number of designs of United States currency will lessen opportunities for counterfeiting. The contention is that the present designs are so numerous—totaling over 50—that the public is not familiar enough with many of them quickly to detect spurious currency.

REVOLUTION'S HAVOC IN THE PRUSSIAN CAPITAL

Berlin has Seen More Actual Fighting Since the Armistice was Signed Than in 51 Months of the War She Started. German Citizens are Seen Here Taking to Cover As the Rebels and the Government Troops Open Fire on Each Other

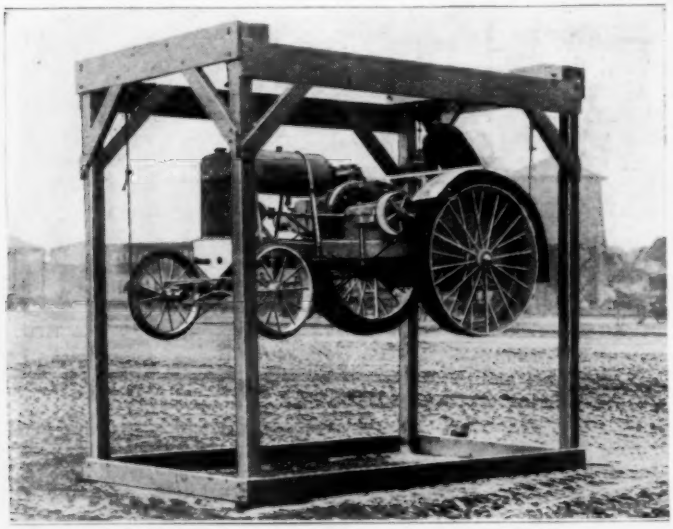
Government Forces with Heavy Artillery Spoiled the Building of the Berlin "Vorwaerts" When Revolutionists Tried to Defend It

Newspapers Figured in the Revolution in More Than One Way. Government Troops Found Bales of Them, Supported by Rolls of Print Paper, Very Effective as Barricades, Firing from Behind Them at the Charging Rebels in the Street

PHOTOS COPYRIGHT INTERNATIONAL FILM SERVICE

TRACTOR RAISED VERTICALLY BY ITS OWN POWER

A man may not raise himself by his bootstraps, but out in Iowa a farm tractor hoisted itself nine feet in the air by much the same process. A heavy timber frame was constructed, inclosing the tractor, and cables hung from the four inside corners. Grooved flanges were attached to the front wheels, around which two cables passed on their way to the driving wheels, where they were made fast. Other cables descended directly to their fastenings on the driving wheels. When the tractor's engine was started in reverse, the cables were wound up on the broad rims of the wheels, and the machine immediately ascended, demonstrating its power.



This Farm Tractor Hoisted Itself Nine Feet in the Air by Cables Hung from the Timber Frame and Passed around the Wheels

NEW SERVICE FLAG TO SHOW EMPLOYES RETURNED

In order to indicate the return of their employes, who had left to join the colors, the management of a prominent New York hotel worked out a new and interesting service flag. The color scheme is the reverse of the present flag, the border being blue and the center white. At the top of the flag is the word "welcome," and at the bottom are numerals indicating the number in service. As each man comes back to work, a star is placed in the white center of the flag. Gold stars are to be placed in the border.

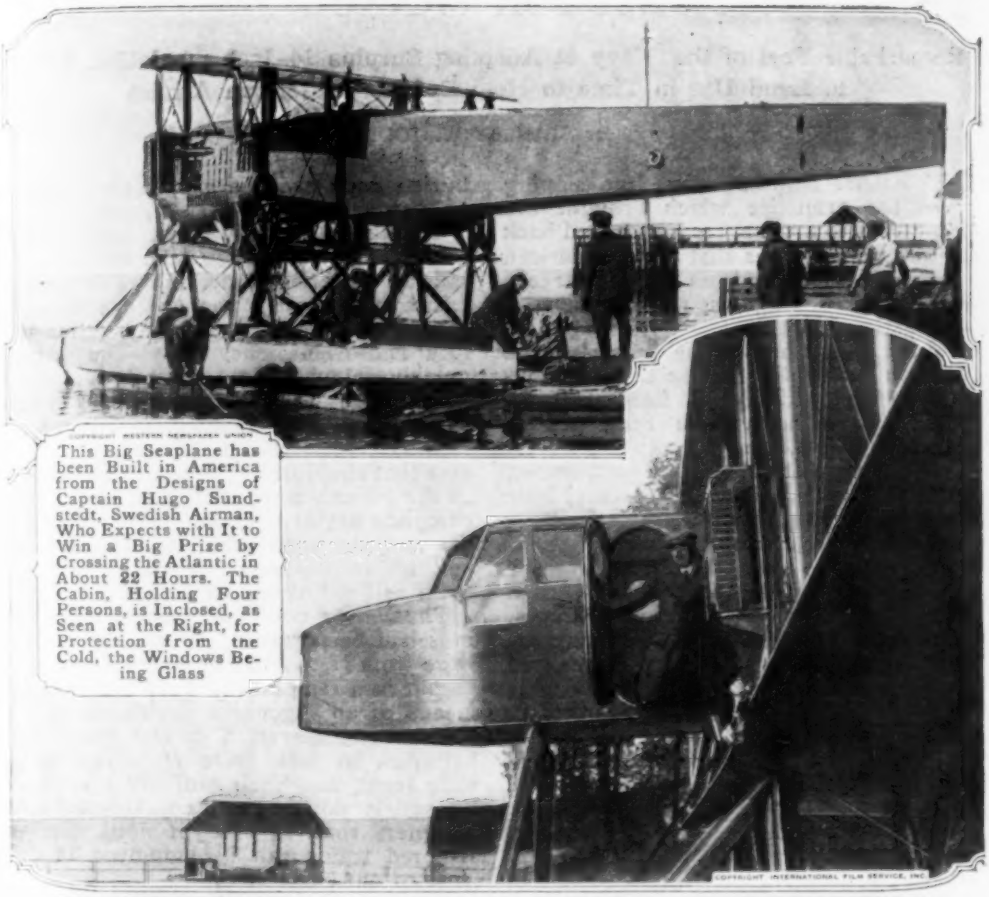
ELECTRIC PROJECTION ARC OF PECULIAR FORM

Not a great deal of progress is visible from year to year in the improvement of electric arcs for projection, so the peculiarities of one lately developed in Europe are quite interesting. A direct-current arc has a horizontal carbon rod for its positive electrode, while the negative pole is a copper ring surrounding the tip of the carbon. This ring is water-cooled, which keeps it from burning, and circulation of the cooling water by convection is automatic. The arc rotates on the ring about the tip of the carbon, making a small, brilliant crater in the end, with no obstructions between it and the projection lenses. The striking of the arc and the feed of the carbon are both automatic, the latter being ingeniously controlled by a thermoelectric arrangement. The lamp has already been found useful for motion-picture work, and has many other applications.

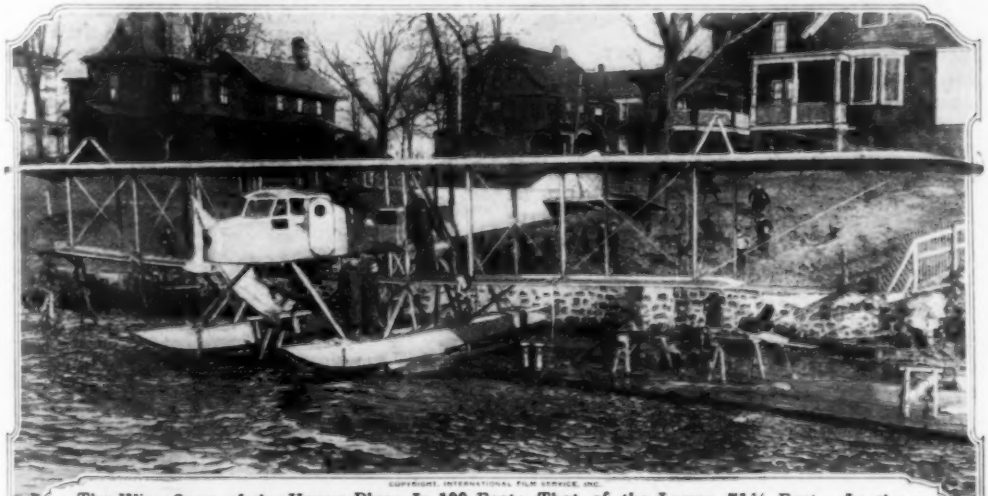
NEW PROTECTIVE DEVICES AGAINST VOLTAGE SURGES

There have recently come to light two German patents showing ingenious devices against electric surges. One describes a clever construction of subdivided cables, in which the cores are crossed at certain points, the outer strands being led into the interior, and vice versa. Since rapid oscillations have a tendency to remain on the surface, when a surge occurs and the current reaches a cross-over and goes into the center, it seeks a path to the outside again. But it is only a part of the surge that succeeds in this, the remainder being sent back along the outer strand. The other patent covers a fuse depending on electrostatic attraction. A U-shaped filament, connected in the circuit and immersed in oil, has at the lower end of the filament two plates, of which one is earthed and the other connected to the line. If the voltage passes the safety point the filament touches the earthed plate and fuses.

PRIVATE PLANE BUILT FOR TRANSOCEANIC TRIAL



This Big Seaplane has been Built in America from the Designs of Captain Hugo Sundstedt, Swedish Airman, Who Expects with It to Win a Big Prize by Crossing the Atlantic in About 22 Hours. The Cabin, Holding Four Persons, is Inclosed, as Seen at the Right, for Protection from the Cold, the Windows Being Glass



The Wing Span of the Upper Plane Is 100 Feet; That of the Lower, 71½ Feet. In the Fuselage will be Carried 700 Gallons of Gasoline. Large Pontoons Permit Landing or Taking Off on a Rough Sea. The Over-All Length Is 72 Feet, and Two Six-Cylinder Motors, Developing 440 Horsepower, Drive Pusher-Type Propellers behind the Planes. The Total Lifting Area Is 1,537 Square Feet, Rudder Area 22 Square Feet, and Estimated Speed 80 Miles an Hour. The Plane Weighs 10,000 Pounds

GIANT NAVY RAILWAY BATTERIES USED IN FRANCE

Remarkable Feat of the Navy in Adapting Surplus 14-Inch 50-Caliber Rifles to Land Use in Time to Help Defeat the German Armies

By STANLEY W. TODD

SEVERAL months before the signing of the armistice which brought the Great War to a close, reports drifted back to the United States that giant American naval rifles mounted on railway trucks were being used against the Germans on the western front. They were said to be of great range and to be harassing the Huns in many different sectors, particularly in the vicinity of Laon and St. Quentin, and later, with even greater effect, at Sedan. In the rapid progress of the allied offensives that were pointing to the inevitable defeat of Germany, little more was heard about these formidable weapons of the American forces.

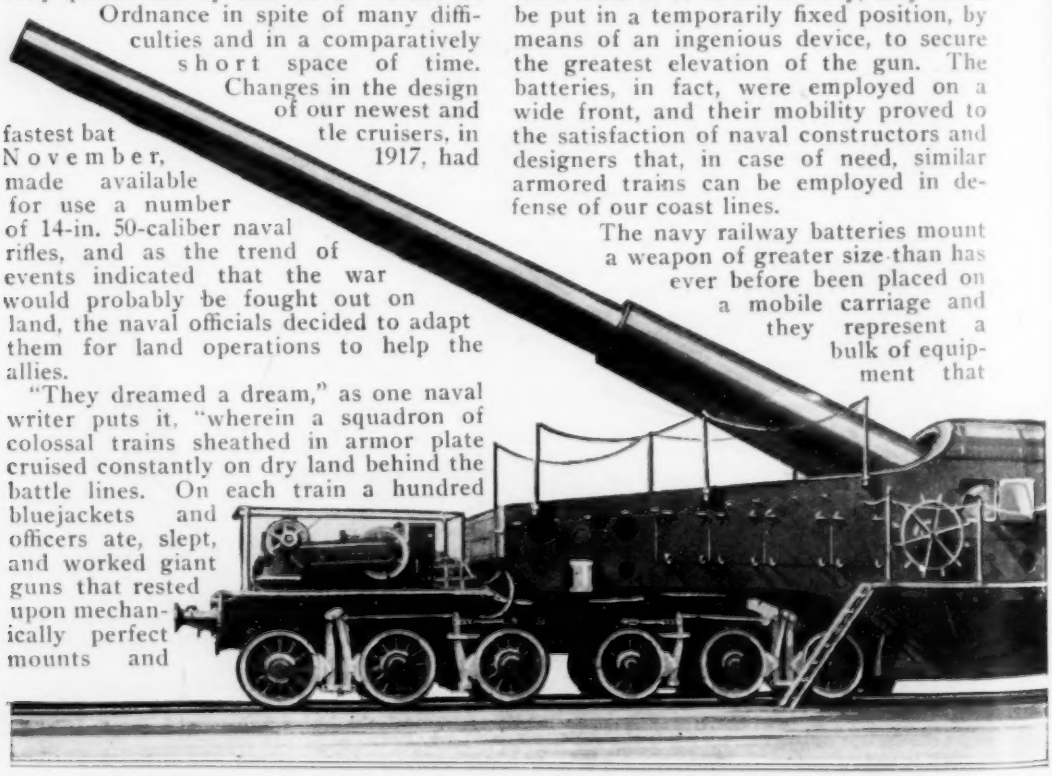
Now that the need for extreme secrecy is removed, the true story of the United States Navy railway batteries may be told. It is a tale of a remarkable feat successfully performed by the Naval Bureau of Ordnance in spite of many difficulties and in a comparatively short space of time. Changes in the design of our newest and fastest battle cruisers, in November, 1917, had made available for use a number of 14-in. 50-caliber naval rifles, and as the trend of events indicated that the war would probably be fought out on land, the naval officials decided to adapt them for land operations to help the allies.

"They dreamed a dream," as one naval writer puts it, "wherein a squadron of colossal trains sheathed in armor plate cruised constantly on dry land behind the battle lines. On each train a hundred bluejackets and officers ate, slept, and worked giant guns that rested upon mechanically perfect mounts and hurled explosive charges to the extreme of their ranges."

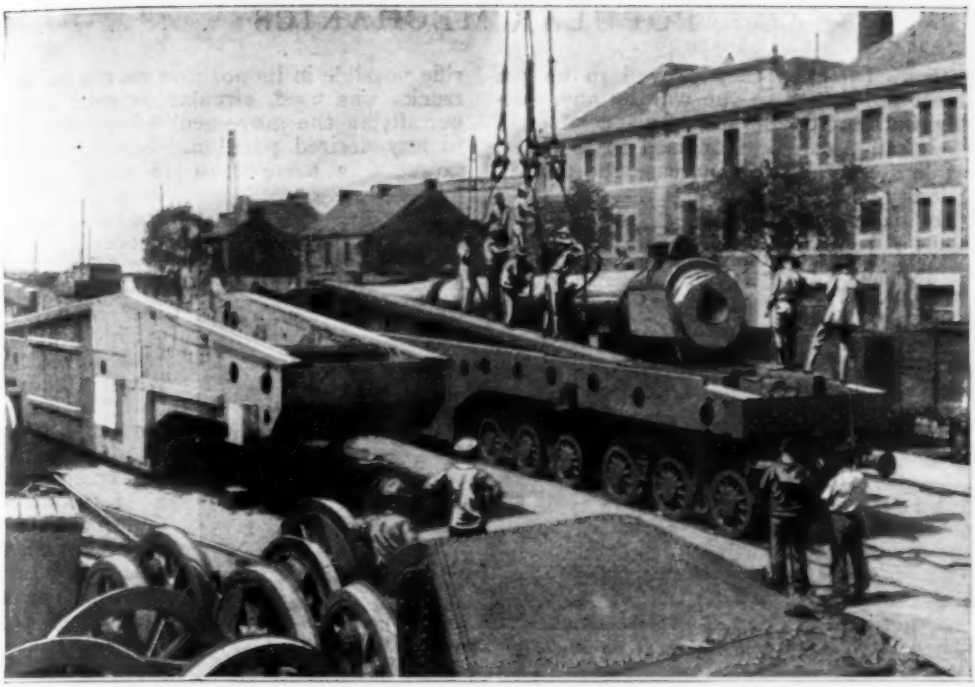
That is practically what was accomplished, and the first of the five massive railway batteries in action, when the armistice was signed, was employed against the Germans within 250 days after the idea had been conceived. The others quickly followed, and more would have been made had not hostilities ended. These were not simply guns erected on railway trucks placed among such other cars that could be obtained on the ground, as the French were compelled to use, but complete armored trains made solely for the purpose, with their own locomotives and all other units necessary to make them self-sustaining in action.

Thus, they could be moved wherever rails had been placed. Where the targets were from 15 to 25 miles away, they could be put in a temporarily fixed position, by means of an ingenious device, to secure the greatest elevation of the gun. The batteries, in fact, were employed on a wide front, and their mobility proved to the satisfaction of naval constructors and designers that, in case of need, similar armored trains can be employed in defense of our coast lines.

The navy railway batteries mount a weapon of greater size than has ever before been placed on a mobile carriage and they represent a bulk of equipment that



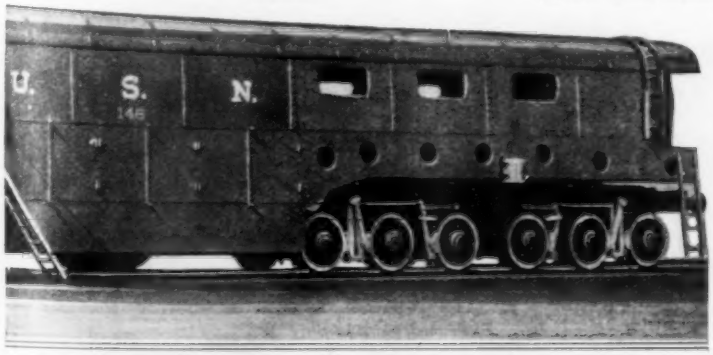
Naval 14-Inch Gun, Throwing a 1,400-Pound Projectile Nearly 30 Miles, Mounted on a Special Railway Car with Great Success in the Latter Days of the War. Each Unit Consisted of a Gun Car Made of Two 72-Foot



The Big Guns and Their Massive Railway Mounts were Assembled at St. Nazaire, France. Each Gun Weighs 85 Tons, the Complete Gun Car Weighing 275 Tons, and Measuring 85 Feet Long, 9 Feet Wide, and 13 Feet High. The Truck at Each End of the Car Is 25 Feet Long, Has 12 Wheels, and Weighs 25 Tons

makes all similar undertakings by other nations seem insignificant in comparison. The gun car, which is, of course, the central unit of a battery train, has somewhat the appearance of a gasoline-motor rail car, with the gun projecting from one end, apparently supported by two sets of 12-wheel railway trucks. The gun car is 85 ft. long, 9 ft. wide, and about 13 ft. high. .It is constructed of two giant girders, 72 ft. long and weighing 145,000 lb., upon which are placed the gun mount and elevating gear, and the gun itself, which is 59 ft. long. When traveling, the barrel is set parallel with the train.

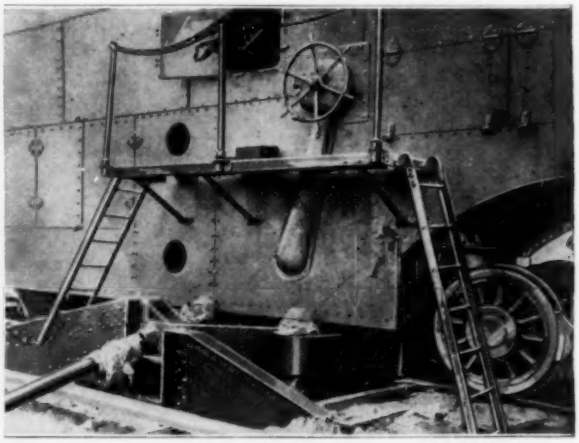
Besides the gun car, a railway battery is made up of a 145-ton American locomotive of the most powerful type; a sand and log car; a crane car; four cars of foundation materials; a workshop car; a battery-headquarters car; a kitchen car; three berthing cars where the officers and men sleep; and two ammunition cars, each holding 100 rounds of ammunition for the giant gun. All of them are covered with bullet-proof steel armor, which together weighs eight tons. The gun unit weighs 275 tons. Each railway battery is thus made up of 16 separate units. In France, each of these formidable batteries was manned by a specially trained crew of 100 sailors, as expert in gunnery as any on a battleship. A train crew to handle the movement of the battery and experienced in train operation was also part of the complement.



Five of These Units were Used against the Germans near Laon and Verdun 72-Ton Bridge Girders on 12-Wheel Trucks, a Locomotive, and 14 Other Cars

As to the ability of these giant naval rifles and their accuracy of fire, the Germans are in a position to testify. Originally designed to throw a projectile of 1,400 lb. over a range of 26 miles, as part of the

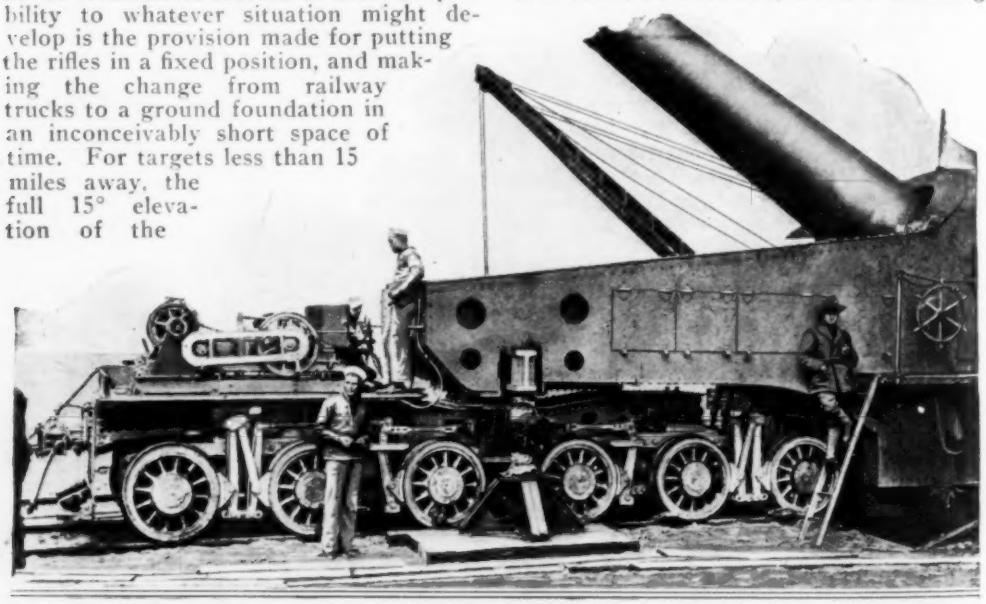
railway batteries they proved to be the finest guns used in the war by any warring nation. By the use of a special shell, their range can be increased to 30 miles, while steps taken to increase the muzzle velocity has also made possible even greater accuracy. The projectiles used in France were mostly of the high-explosive type. When the gun was fired on the rails, there was a backward movement of the car of 26 ft. The shells left the muzzle of the gun at a speed of 2,800 ft. a second—a greater velocity than possessed by any gun of its kind. The powder charge was 484 lb., developing a kinetic energy of about 4,000,000 ft.-lb., the recoil being absorbed by a hydraulic brake with a 44-in. slide.



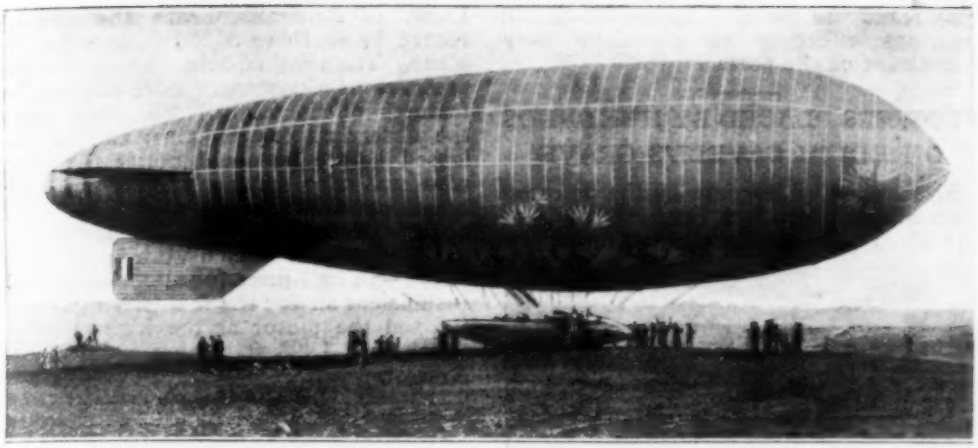
For Firing at an Angle of Elevation Greater Than 15°, a Pit Foundation was Prepared and the Gun Mount Deposited on It by Powerful Jacks

The railway batteries were built for use under fire, and several of them underwent it. A remarkable feature of their adaptability to whatever situation might develop is the provision made for putting the rifles in a fixed position, and making the change from railway trucks to a ground foundation in an inconceivably short space of time. For targets less than 15 miles away, the full 15° elevation of the rifle possible in its position on the railway trucks was used, circular or spur tracks permitting the movement of the gun car to any desired position. But where the target was more than 15 miles away, a greater elevation was needed, and provision had to be made for the recoil.

This problem was solved by what is known as a "pit foundation." A pit is dug under the tracks and a steel girder and timber base are erected, both being part of the train equipment. The gun car is run over the pit, where the monstrous gun and girders are lifted up from the railway trucks by means of heavy jacks, the foundation built up to meet them, and the trucks moved away. Thus, in comparatively few moments, it was possible to put the rifles on a stable foundation, where the limit of a 45° arc elevation could be obtained, while a traveling



The Elevation for the Extreme Range of Nearly 30 Miles: This View Reveals How the Great Girders of the Gun Car are Jacked Up from the Trucks When the Pit Foundation is Used. The Angle of Elevation Here Is About 45°. For Shorter Ranges the Gun is Fired from the Rails



The Largest Dirigible in the United States, the "C1," Which Made a Flight of 1,385 Miles from Far Rockaway Naval Air Station, New York, to Key West, Florida

gear made it possible to train the gun from right to left sufficiently to insure accuracy of fire up to 25 miles. The targets were often very definite objects, like a railway junction, and subsequent investigation showed that the naval gunners made few misses. Airplanes helped to spot the targets.

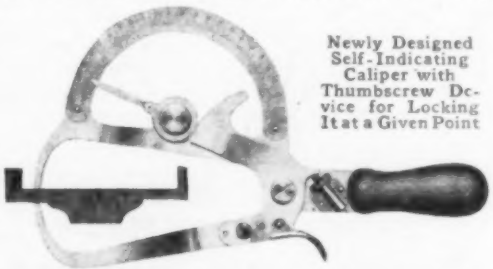
Some idea of the tremendous range of these rifles can be gained from the difficulties encountered in finding a suitable proving ground here before they were sent abroad. None of those available was large enough, and the first gun car had to be taken to Sandy Hook for trial. The gun gave plenty of evidence that it could shoot straight and true, and soon afterward it was on its way to the western front to speed the German retreat.

AMERICA'S LARGEST DIRIGIBLE FINISHES LONG FLIGHT

From the Naval Air Station at Far Rockaway, N. Y., to Key West, Fla., was the flight made by the "C1," America's largest dirigible, a distance of about 1,385 miles, in 29½ hours. Capt. S. V. Parker and his crew of six men experienced few difficulties with the big craft and maintained an average speed of 47 miles an hour. They left Far Rockaway Sunday morning, January 12, and arrived at Key West Wednesday, January 15, at 2:58 p. m., stopping at Hampton Roads, Va., Georgetown, S. C., and Brunswick, Ga. The only repairs made en route were a broken lead pipe fixed in mid-air by crawling out on the outrigging, and a faulty steering gear, for which a landing was made, the natives below being told what help was needed by notes sent down in parachutes. The highest altitude reached was 2,500 ft., and the only storm encountered was a harmless squall off Jupiter, Fla. This remarkable record in long flights was supplemented a few weeks later by the performance of a sister dirigible, the "C3," which ascended at Cape May, N. J., and stayed aloft 33 hr. 6 min. This is asserted to be the world's endurance record for nonrigid air craft.

NEWLY DESIGNED CALIPER TO FILL LONG-FELT WANT

What promises to be a very valuable addition to mechanical devices is a newly designed caliper to which is attached a graded scale, enabling the user to get his reading immediately. In construction this caliper is extremely simple and is so arranged that any wear on the parts may be taken up by a slight adjustment. One of the main features of the device is the



Newly Designed Self-Indicating Caliper with Thumbscrew Device for Locking It at a Given Point

adjusting screw, located next to the handle, by which any specified measurement may be retained. The lower, or movable leg, is interchangeable, and any desired shape may be substituted. The caliper

may readily be operated by one hand, ball bearings effecting an especially easy movement of the parts.

FLOWERS PLACED BY HUNDREDS ON EDITH CAVELL'S GRAVE

Evacuation of Belgium by the defeated Germans placed in the reverent hands of the allied armies the grave of Edith Ca-

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Grave of Edith Cavell, Slain by the Germans in 1915, at St. Gilles, Belgium, as It Looked After Hundreds of Visitors had Decorated It with Flowers

vell, the English nurse of imperishable name who was murdered by German military order Oct. 13, 1915. The grave, in the yard of the prison of St. Gilles, in the suburbs of Brussels, has been decorated with flowers by hundreds of visitors. Among the cards attached to the decorative evidences of affectionate emotion are many bearing names of high rank.

FLIER IN NEW HEIGHT RECORD BREAKS OXYGEN PIPE

Six miles up the air grows thin and very cold and an airman up there with a broken pipe on his oxygen bottle is in a serious predicament. That is what happened to Lieutenant Blowes, of the British army, when his pilot, Capt. Andrew Lang, of Australia, broke the altitude record by reaching 30,500 ft. in a British plane. The time, 66 min. 15 sec., and the presence of a passenger were noteworthy features of the flight. Vibration broke the observer's oxygen pipe, and he collapsed before he could notify the pilot, who was also having trouble with his breathing and heating apparatus. The observer recovered on the return to 10,000 ft., but both airmen were badly frostbitten—a small price for a world's record. Insufficient air for the fan-driven gas feed stopped the motor at the highest stage, which was 1,498 ft. higher than Mount Everest.

LEATHER SUPERSEDES PAINT FOR AUTO-BODY FINISH

Several automobiles have appeared lately along the Pacific coast with their bodies entirely covered with a skin of leather as smooth and close-fitting as the original paint itself. One of the modern imitations of leather has also been adapted to this novel purpose with entire mechanical satisfaction and unusually pleasing effect. Both Spanish and patent-leather finishes are used, in some cases covering fenders and shock absorbers as well as body. The leather or substitute is backed with a special adhesive and applied, over the old paint if necessary, to all parts of body and hood. Wiping with a damp chamois skin or sponge, and occasional dressing with wax, is all the attention needed to keep the surface indefinitely in good condition.

PLANT NEW TREES TO RESTORE DESTROYED FRENCH FORESTS

Plans have been made, and now await only the official sanction of the French government, to begin the restoration of famous French forests by transplanting Norwegian trees. The plan originated in Norway, where it has aroused considerable enthusiasm, the proposition being to plant 250 acres a year over a period of five years. The spot selected for this work was formerly the site of one of France's most beautiful forests, extending from the Ardennes toward the Belgian frontier, just behind Arras. The plan calls for not the slightest expense on the part of France, it being proposed to send over Norwegian experts with the proper equipment of trees, tools, stores, etc., the money being furnished by subscription.

THE EYE BEHIND THE LINES

Thrilling Story of Winning Battles with Photographs Told in Detail for the First Time

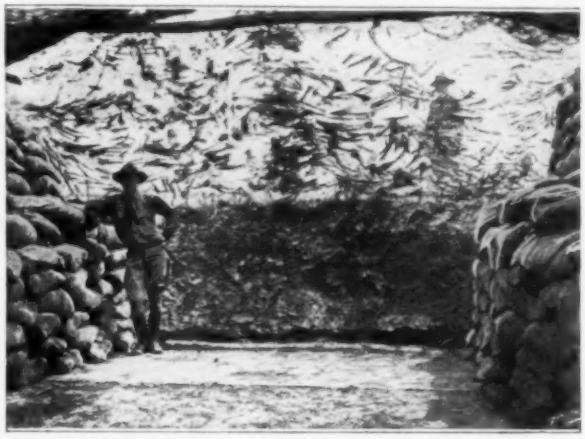
By DOUGLASS REID

Part II.—The Stereoscope—Deadliest Weapon of the War

BESIDE the plush album on the center table in the parlor of half the homes in America rests one of the deadliest weapons of this war. And yet, in all of American preparedness plans, in all the arming of a nation, not one voice lifted itself to suggest that a million citizen soldiers spring up overnight with stereoscopes in their hands.

The old-fashioned stereoscope through which Uncle Elmer, Aunt Hetty, and little Chester—Sunday visitors—used to gaze so breathlessly upon marvelous views of the Mammoth Cave, Lincoln's Funeral, and Sardine Fishers off Brittany; this quaint semiridiculous old instrument of Sabbath entertainment carried roaring, smashing hell to the Huns of Wilhelm, the "scourge of the world."

It was the stereoscope that proved to be the greatest single aid to the detectives of the aerial photography corps of the allies in their discovery of the expertly hidden batteries of the Germans. It was the stereoscope that penetrated the best battery camouflage that German artillerymen ever devised. Further than that, it removed the one great obstacle to the correct reading of aerial prints—lack of the proper perspective. The camera in the air shoots directly downward, in its pictures the height of objects is lost, and an entirely new viewpoint on the world given the observer. The familiar objects of life become mysterious to him when he cannot see their dimensions in the common fashion.



This Battery Camouflage—Wire Netting Covered with Wisps of Straw—Defied Ordinary Photography but Yielded Its Secrets to the Stereoscopic Method. The Picture Represents an American Reproduction of the Most Perfect Type of Gun Concealment Ever Developed by the Germans

The picture made by a camera looks with one eye. A man looks with two eyes, and these two eyes, being a few inches apart, inform the brain that the object looked at has length, breadth, and depth. A one-eyed man looking at the front of a house would say it was a wall, but if he had another eye it would see a little of the side of the house and signal the information to the brain that the object had three dimensions.

A one-eyed or cross-eyed man is not successful as a baseball player because it takes two eyes, and these in the proper axial relation, to judge an object coming directly toward him. Viewing an approaching baseball with two eyes, the player sees not only the growing size of the object, but each eye sees it from a slightly different angle—and can judge its speed.

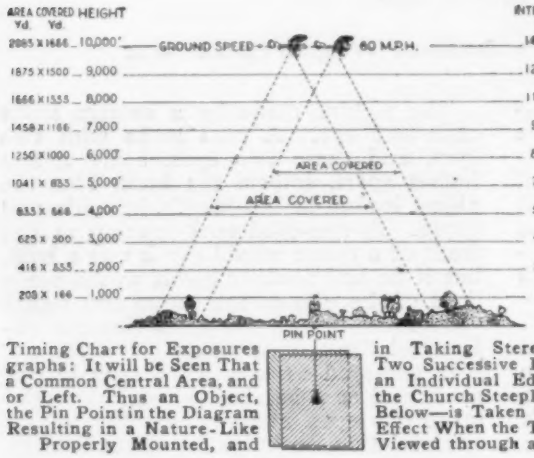
A sage hen in the West can easily be killed with a thrown stone, because the bird viewing the approaching pebble with only one eye cannot judge its path or dodge it.

Now the aerial photographers applied this truth as follows: They knew that two photographs taken of the same object with an ordinary stereoscopic camera, in which the lenses are 2¾ in. apart, would not produce the stereoscopic effect, since the object photographed would be miles below, too far for the camera to catch its dimensions and make them apparent in a picture.

However, the photographers bethought themselves that if they put 100 yd. between the two pictures—snapped a trench

from one elevation, moved 100 yd. ahead on a level, then shot again—it would be as though a giant with 100 yd. between his eyes were looking at the object.

So they tried this, mounting the resultant photographs on cardboard and looking at them through an old-fashioned stereoscope. The result was better than their anticipations; the depth and height of objects were tremendously exaggerated. A cottage looked like a tower, a bucket like a well, a trench like a cañon, a hill like a mountain. But they soon learned to translate these eccentricities into common sense—the great thing had been done, the landscape was made to assume reality in pictures.



Timing Chart for Exposures in Taking Stereoscopic Photographs: It will be Seen That Two Successive Exposures Cover a Common Central Area, and an Individual Edge to the Right or Left. Thus an Object, the Pin Point in the Diagram Below—is Taken from Two Sides, Resulting in a Nature-Like Effect When the Two Pictures are Properly Mounted, and Viewed through a Stereoscope

Hundreds of mysterious little specks, trails, and lumps on every aerial photograph, which before had troubled the men who examined them so carefully with their magnifying glasses, could now be recognized quickly and easily. The discussions, arguments, and quarrels between the photographers who reported thus and so to the infantrymen, and who were contradicted by the latter, were thereafter banished from the conferences of the commanders. They could now tell whether a white spot on the ground was a flat, canvas, bull's-eye panel signal to enemy airmen, or a slightly raised or slightly sunk concrete platform for a machine gun. The black bottom of a shell hole, and the black entrance to a subterranean gallery, were now as distinct to the observers as to the infantrymen who charged across them. Roadside ditches, in which men might lie in insufficient shelter, could now be told from high walls behind which there was ample shelter—an extremely important thing to know when men are to charge into such territory. Steep slopes up which the men were to charge, and which had been in ordinary photographs flat as water, now showed themselves in their true nature—death traps—and the discovery of the fact saved the lives of the attackers. All the irregularities of the terrain, gulleys, ridges, etc., that would hinder or help military operations, were now revealed, and with such exaggeration that no student could miss them.

One grave danger was ever present in this stereoscopic work, however; if the stereos were not mounted correctly, if the picture for the left eye was mounted on the right-hand side of the card and the right picture on the left, then the whole scene would be reversed—trenches would be walls; shell holes, mounds; hills, valleys, etc. And if the mistake were not detected in time, assaulting troops might be sent into this sector and, mystified, be cut to pieces.

One sure way to detect an error of this kind was available if the picture contained a house or a river, for then the sinking of a house into the earth, or the progress of a river along the crest of a hill, would become immediately and ridiculously apparent.

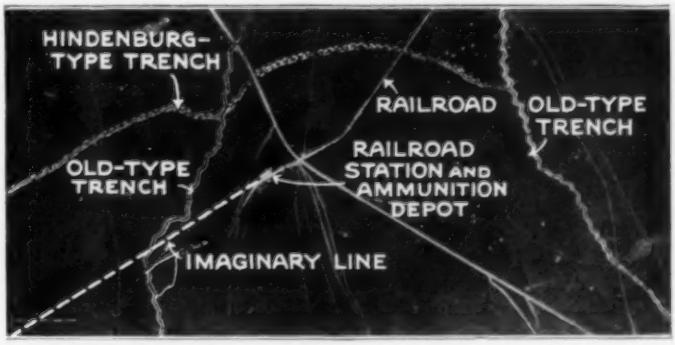
But the stereoscope's most important victory was over enemy camouflage. The Hun artillerymen were proud of their wire-netting scheme. This consisted of a covering of ordinary latticed wire over their gun. It did not blanket the gun or its men from the light, yet it did hide them, for the crisscrossing strands of wire broke up the vision of the ordinary camera from above. One photograph of it would show nothing, since the wire muddled all outlines beneath it. A picture of the lattice would in reality show the gun and the men, but the human eye, used to certain definite outlines and shapes as meaning certain definite things, could not see them.

So the stereoscope men took two views of each of these, one picture from one side, the other from the opposite side, printed them, superimposed them before the observer's eye by means of the stereo-

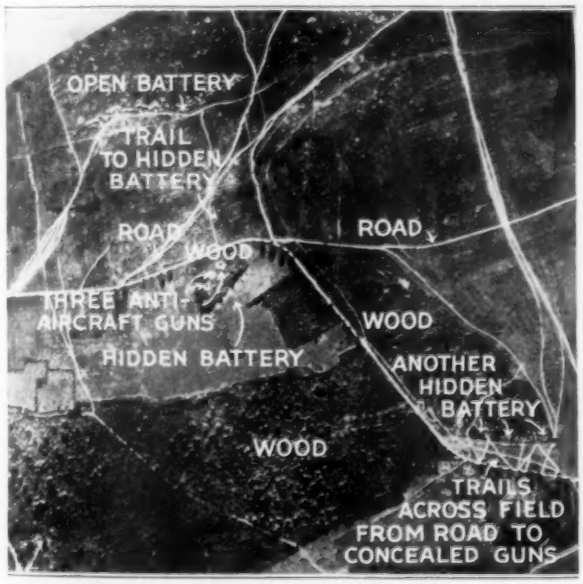
scope, and the whole gun stood revealed, the portions of its outlines missing in the one picture being supplied in the other. Often, too, men in outposts and listening posts, snipers, and all the horde of secretive characters who made war silently picturesque, hid under this wire screen and lay laughing up at the camera planes that sought to unmask them. They had only to wait until the photographer had gone home, delivered his pictures, via stereoscope, to the artillerymen, to have a deluge of shells fall upon them.

I can imagine the allied photographer in the dark room, holding the stereoscope to his eyes and laughing at the Hun in the hole who laughed up at him, while the guns outside are tolling the Germans' doom.

The stereoscope's work on batteries does not lessen the extreme value of the ordinary camera picture. The photographers attached to the United States army worked in close liaison with the artillery and infantry, supplying both with information that meant life and death to them, giving them the clues, the hints, the vital revelations about the enemy's plans. Before the camera detectives came to the rescue, the German battery tricks were dark to the allies. Balloon and listening-post observation was not completely satisfactory. At night, the watching intelligence officers would catch the flashes of German guns, mark their location and shell the point violently, only to fail. The next night the flashes were here, there, everywhere.



A Railroad Station and Ammunition Depot had been Blown Up by German Shells. The Hun Battery must be Located and Destroyed. But How? This Photograph Gave the Clue. The Shells Used All Fell in One Line, Some Short of and Others beyond the Station. This Line was Extended Back into the German Positions and Another Similar Line Determined from Photographs of a Bombarded Station 30 Miles Away. The Intersection of the Two Lines was Shelled and Soon the Big Guns were Silenced

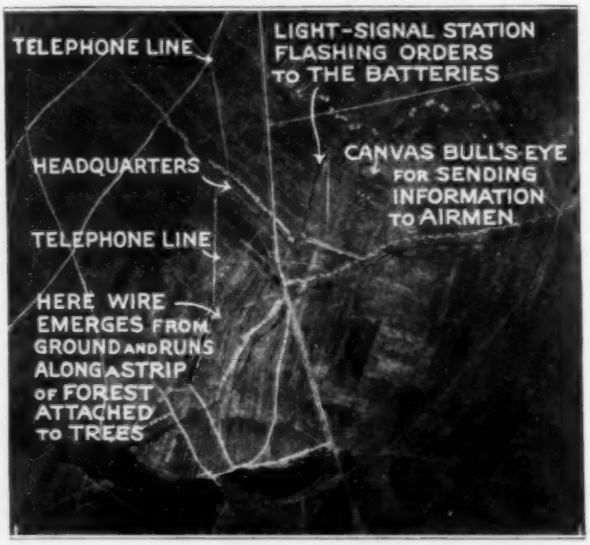


A Favorite Trick of the Germans, to Confuse the Camera Scouts, Was to Place Some Batteries in the Open and Conceal Others, Generally on the Edge of Some Near-By Wood. A Russian Prisoner of the Germans and Captured by the Allies, Told of having Assisted in Building Two Hidden Batteries in This Location. The Photograph Showed Up a Path Leading to One of Them and Trails from a Road to the Other. It Also Revealed Three Anti-Aircraft Guns near the First Battery

Pictures proved that the Germans had four emplacements for each battery of light fieldpieces (corresponding to the famous French 75's), and that each battery contained four cannon. The emplacements would sometimes be a mile from each other, and during the night it was the custom of the Germans to move the battery from one place to another, so that the allies could not locate them. After the battery had left an emplacement, some artillerymen would remain behind to fire off flares, one after the other, four in number and close together, in imitation of a battery at work. Then, in all four of the various emplacements, flares would flash into the night, and the allied observers would be puzzled, indeed, for it was evident that only from one of them shells were issuing. Which was it?

The camera men got the answer.

When a cannon shoots directly ahead—that is, with only a slight elevation of the muzzle—it whips up the ground for a few feet around with the very force of its concussions. These marks—called "blast marks"—the camera detects. Consequently, discovering all four battery emplacements by the stereoscopic method and locating the shell blasts with the ordinary photographs, the detectives show just where the night flares were real cannon discharges and where they were false flashes. The winds are usually strong enough to smooth out the telltale blast marks within 24 hours.


TELEPHONE LINE
LIGHT-SIGNAL STATION FLASHING ORDERS TO THE BATTERIES
HEADQUARTERS
CANVAS BULL'S-EYE FOR SENDING INFORMATION TO AIRMEN
TELEPHONE LINE
HERE WIRE EMERGES FROM GROUND AND RUNS ALONG A STRIP OF FOREST ATTACHED TO TREES

German Headquarters for Correction of Artillery Fire, Caught by French Camera Scout: It was Located by Following Telegraph or Telephone Lines to Their Converging Point, and Further Identified by the Installation Near By of Stations for Flashing Orders to the Various Batteries and to Airmen

Even without the stereoscope, the camera can locate well-hidden batteries by the mere location of these concussion marks, and when snow falls, the camera men are joyous, for then every discharge is marked unmistakably, the blast marks being black on snow, while on the ground they are white.

The snow is merciless, and every footprint, every truck track, is as apparent as red paint on a canvas. Often the Germans in their efficient haste would construct new batteries while the snow was still on. How the allied photographers whooped at this and hurried home to show the new works, black, distinct—an easy target for both bombers and artillery!

Wire-Netting and Straw Camouflage Taken by Single Exposure with Ordinary Camera: The Light Rays are Broken Up So That the Picture Reveals Nothing of What is Concealed Behind

The allies used almost as many photographers in shooting up their own lines as in picturing the enemy lines. Whenever an artillery officer desired to place one of his own batteries in an advantageous spot, he consulted the photographic officer of his sector, and with him went over the available locations, picking and choosing a point where his guns could hide and where their blast marks would not be apparent. The edge of a wood, by the side of which ran a white wagon road, was the favorite spot for the gunners of both sides, for there the trees would hide the guns and the white road show no marks of the concussion.

Once a French officer made a bet with a photographic officer that he could place a battery so well that no camera could detect it. He placed it in a wood, pointing his guns over a white road. It was perfect. But the photographic officer had seen in photographs a faint change of color on the road for some miles, a subtle darkening on the causeway, beginning at headquarters and running to a certain point in front of a wood. This, he reasoned, was crushed stone thrown upon the road in order to strengthen it for the passage of guns and ammunition trucks. The crushed stone, while fully as white as the road itself, was looser than the packed, hard surface of the untouched path, and ab-

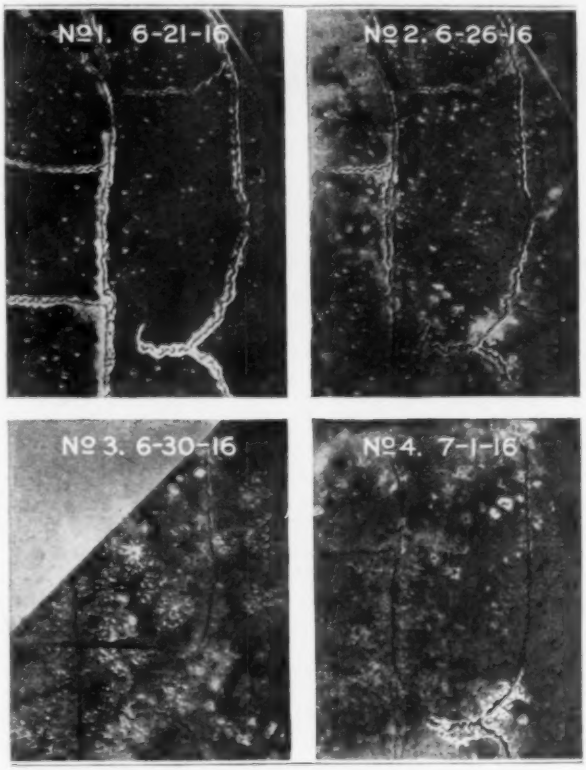
sorbed more light, appearing slightly darker to the camera's eye.

So the photographic officer decided that the artilleryman had done this for moving his guns, and that where the crushed rock stopped, there was the battery. He walked over to the artillery officer's tent and collected his bet.

Quarries, sunken roads, and large ditches were other favorite hiding places for batteries, since they permitted the gunners to tunnel back under one side, place the gun there, and so, in concealment, shoot all day long. But the camera men with stereoscopic pictures caught these depressions that otherwise would have been invisible, and, by photographing the wall opposite the muzzle of the gun, caught the discoloration caused by the blasts.

When the Germans chose to hide their big guns in the middle of a forest, the task of searching them out became tremendous, for the leaves in the majority of cases defied the stereoscopes, and the cutting up of the trees by shells was not sufficient to be noticed before some weeks' steady firing.

The ordinary camera's only way of locating the guns was to watch for the trails of artillerymen appearing on the edge of the wood, or the marks of motor trucks which brought ammunition up to the fringe of the forest under cover of night. Often the direction of these telltale tracks would betray the part of the wood in which the guns were concealed. Here the stereoscope, too, accomplished wonders, for it was the part of German efficiency to camouflage the guns, even though they stood in the midst of thick forests. They placed canvas, painted to resemble the floor of the forest, above the guns, at a height about two-thirds the length of the trees to which it was attached. This the stereoscope camera detected, for it revealed one portion of the wood where the ground rose up strangely. All the artillery need do was thunder shells down on this seemingly innocent spot. In nearly all these cases, the Hun's extreme reliance upon science proved his undoing, for if he had refrained from camouflage he would have been safe.



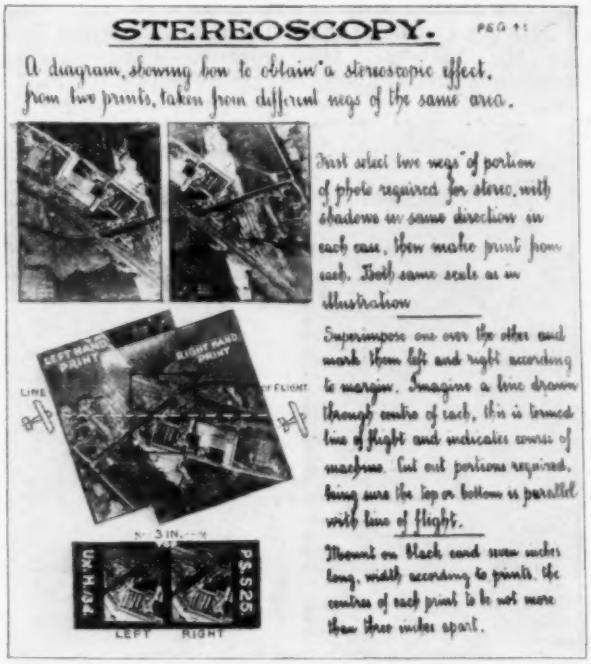
Progress of Shelling a German Trench Sector: The Gradual Disappearance of the White Borders of the Trench Lines—the Parapet and Parados—Indicates the Destruction Accomplished. On June 30, the Sector was Considered Untenable and Abandoned, So the Allied Infantry was Scheduled to "Go over the Top" the Following Morning. Luckily, the Last Photograph was Brought In in Time to Postpone the Attack, for It Showed, by the White Marks at the Bend, That the Germans had Partly Reconstructed the Trench during the Night

It was another habit of the Hun gunners to place some batteries out in the open—real batteries, on the presumption that the allies would laugh and refuse to bother with a thing that so obviously was nothing but a trick. This was good psychology for the Germans, but it didn't work; for the photographs showed footprints about the guns, telling that they were active. Had the battery been false, no tracks would have led to it.

Certain astute German officers, however, finally took to making false trails to false batteries, and for some time fooled the photographers. But the coming of snow usually saved the latter from humiliation, for at the crack of dawn they could

catch pictures which revealed that no men had gone out to the guns, while the blast marks of the real batteries betrayed the latter, skillfully hidden in some other part of the field.

As photography became more and more important on both sides, the artillery forces became more and more expert in concealing their guns. Finally, whole groves of trees were moved here and there to mask batteries. Here the shrewdness of the clue hunter's eye became the vital thing. He had to know his territory perfectly, memorize each tree, stick, and stone. If he caught any change, however small, it meant mischief.


STEREOSCOPY.
A diagram, showing how to obtain a stereoscopic effect, from two prints, taken from different negs of the same area.
First select two negs of portion of photo required for stereo, with shadows in same direction in each case, then make print from each. Both same scale as in illustration
Superimpose one over the other and mark them left and right according to margin. Imagine a line drawn through centre of each, this is termed line of flight and indicates course of machine. Cut out portions required, being sure the top or bottom is parallel with line of flight.
Mount on black card same under long, width according to prints, the centres of each print to be not more than three inches apart.
LEFT HAND PRINT
RIGHT HAND PRINT
LINE
OF FLIGHT
LEFT
RIGHT

The Proper Cutting and Mounting of Stereoscopic Photographs Is of Utmost Importance, for Otherwise the Whole Scene would be Reversed, Trenches Becoming Walls, Shell Holes, Mounds, and So On, and Attacking Troops might be Sent to Useless Death

One photographic officer, of the French forces in the Argonne, once found a tiny, obscure glade in a forest missing. Checking back on previous photographs, he found that the glade had disappeared overnight. The stereoscope showed him that it had been a steep little slope and hence a good location for artillery. He knew instantly that the Germans had transplanted trees from the thickest part of the forest to this glade, and that cannon were at that moment working from the new position.

The camera, aside from its detection of battery camouflage as distinct from reality—a subject that will be taken up more completely in the next article on trench photography, where it properly belongs—was invaluable in constantly adding to that rogue's gallery of German generals which the allies collected and used so effectively. Photographs silently, surely, told the intelligence officers where such and such a German artillery officer was working, where Colonel von E. or von F. was stationed. This was in the main accomplished by recognizing his particular and distinctive tricks of camouflage. The German organization lent itself to this allied system of discovery handily, while the forces of freedom baffled the Germans in the same work; for all the allied systems of camouflage were standardized and worked out to the last detail by the department of camouflage in Paris and thence supplied to all sections of the line, while the Germans relied upon each artillery officer to work out his own system.

Hence allied photographs taken over a series of months showed the pet hobbies and theories of each Hun commander. Colonel von E., for instance, would rely upon putting out quantities of false batteries, in the meantime covering his real batteries entirely with canvas camouflage. Colonel von F. would put out no dummy guns and would choose to hide his batteries with timber, specially moved to the chosen spot. Colonel von G. habitually relied upon one dummy battery, three real ones audaciously set out in the open to disarm suspicion, and the rest hidden under wire-netting camouflage.

Through their filter lenses, which told instantly where canvas camouflage was spread, and with the stereoscope, which exposed wire netting, the photographers could show their army commanders just where these respective colonels were, just how strong their ordnance was, and from this the allied artillerymen could trace back and discover exactly how this particular officer handled his guns, which were his favorite hours for shelling, how adept his gunners were at aiming, and what had been their strong points and their weak points in previous engagements.

Where German telegraph and telephone lines stretched through the sections given over to the battery photographers, they suffered heavily, for the allied cameras were constantly searching for artillery headquarters, always to be found at the converging points of all telegraph and telephone wires from observation posts. To the officer seated in this headquarters, the observers sent in their reports on the effect of their own batteries. Over other wires the officer sent corrections to his batteries. The principal duty of the photographers was to locate this man and direct allied shells to him, for the moment he was silenced, the moment headquarters was wrecked, the German batteries were silenced—the eyes of the guns were put out.

By Placing a False Battery Out in the Open and Making a Path to It from the Road, the Germans Sought to Prevent Discovery of the Hidden Battery on the Fringe of the Wood beyond the Road. But When Snow Came, the Faked Trail to the Open Battery had Disappeared, and Telltale "Blast Marks" Gave Away the Real Position of the Active Guns

One photograph caught a telegraph or telephone line winding to somewhere, another photograph caught another. All were traced and painstakingly run down to some common center. Where they converged there was headquarters. One carefully placed shell on this spot would relieve the allied trenches for miles about from shelling.

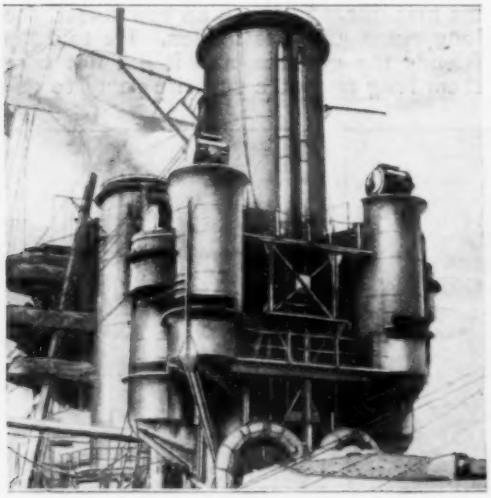
By studying the photographs of their own batteries, the photographic officers of both sides often located their big-gun assailants. To the man who was being shelled, the bombs seemed to come from all directions, swirling, pounding like a storm. But to the student who pored over a photograph of the same scene, the shells were seen to come from one certain direction. Their bursts upon the ground were on a line which, when traced back on the photo map of the whole German system, would cross several suspicious spots where the German guns might be. Unable to decide just where the guilty party was, the photographic officer moved to a picture of another part of his own line where shells fell, say, yesterday. He got the line along which these bombs came, and ran it back until it intersected his first line. There in an evil forest, the long-range gun was hidden. He told his friends the gunners, and it did not take them long to give a surprise party to the well-secreted Huns who had been "straf-ing" them. The most elaborate battery camouflage was a collection of anti-aircraft guns, for wherever the allied fliers were met by storms of shells from "Archie," they backed off to escape the death that rode on that perfect barrage. But they knew immediately that something tremendously important was hidden, else Archie would not be so determined. So it was their fashion to haunt this sector valiantly, slipping through on clouds, photographing with long-focus cameras from a great height, scaling down in fog to within a few feet of the ground, snatching a snap picture, then darting away to safety. Death was close in such cases, and the task the severest that the photographer could meet, but his pride was challenged, his "dander was up," and, what is more important, his curiosity was aroused. He was sleuthing and "wanted to see."

(To be continued)

SEARCHLIGHTS ARE SHIELDED ON BRITISH WARSHIP

Bluejackets have a nickname for everything, and that is probably as true of the boys in the British navy as it is of our own "gobs." The cylindrical shields for the searchlights on an English battleship are called "coffee boxes." These guards were developed out of the necessity, which became evident during the war, of providing a shield for everything destructible. The searchlight shields are

simply curved sections of armor plate which, viewed from the deck, look like complete cylinders. The searchlights in



The Cylindrical Objects to the Right and Left of the Funnel on This British Battleship, the "Marlborough," Are Shields into Which the Searchlights Descend. The Sailors Call Them "Coffee Boxes"

use project above them, and descend into them when the ship is in action.

ELECTRIC-LIGHTED PORTRAIT IS PHOTO NOVELTY

"The Light That Lies in Woman's Eyes" seems destined to materialize with the aid of a device originated by a Chicago photographer. "Illuminated portraits" is the term applied to the novelty. The studio exposure is made in the usual manner, but instead of the customary paper print, a positive on glass is taken from the negative film. This transparency is

Photograph Printed on Glass and Mounted in a Hollow Frame, which Contains a Small Electric Light, Making an Illuminated Portrait

then carefully colored from life by artists in the studio. When finished it is mounted in a box frame about three inches thick, which leaves considerable space behind the glass. In this space is a small electric lamp, hung from the top of the box, which is hinged. Small holes allow the escape of the air heated by the lamp, and a long cord and plug provide for connection to any light socket that is convenient.

ENGLAND TO USE NEW SCHEME FOR RURAL TRANSPORTATION

After a careful consideration of the various methods looking primarily to the promotion of agriculture, the Ministry of Reconstruction of England has come to the conclusion that an extensive system of light railways is desirable. The tracks would be of 2-ft. gauge, cheaply constructed and easily laid, either on the road, or, where that was not wide enough, over ditches and waste land alongside the road. There is much light-railway material in France and elsewhere which could be utilized, and in case this is all taken over by the French government, manufacturers are fully equipped for making new. While passenger cars have been suggested as possible, the primary use of these lines would be for the hauling of farm produce, road materials, etc., and it is considered that passenger service could scarcely be either frequent or punctual. It is also suggested that side lines could be run from the main line into each separate farm, right up to the farmer's door. Motive power could be by either steam or electricity, according to local conditions.

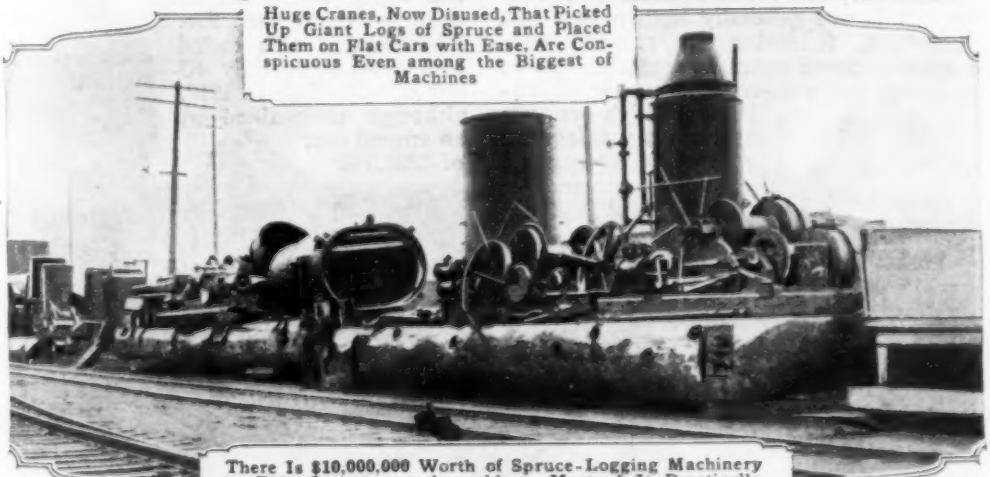
ACRES OF DISUSED MACHINES MARK END OF SPRUCE CUT

All the equipment that was used by the government to cut airplane spruce in the remote forest districts of Washington and Oregon has been assembled at Vancouver for disposal. There are great lines of logging cars with their locomotives, huge cranes capable of handling big spruce logs like matchwood, donkey engines, saws of all sorts—in fact, the greatest collection and assortment of equipment the government has gathered together since the Panama Canal was completed. The machinery, which was used by 60,000 soldier and civilian members of the Spruce Production Division, is valued at $10,000,000 and covers acres of land at the point where it is stored.

Hundreds of Logging Locomotives Like These are Included in the Government's Collection of Discarded Spruce-Working Machinery Now Gathered at Vancouver, Washington, for Disposal

Countless Logging and Donkey Engines of Every Type Are among the Articles Found Unnecessary, Now That the Pressing Demand for Airplane Spruce has Passed

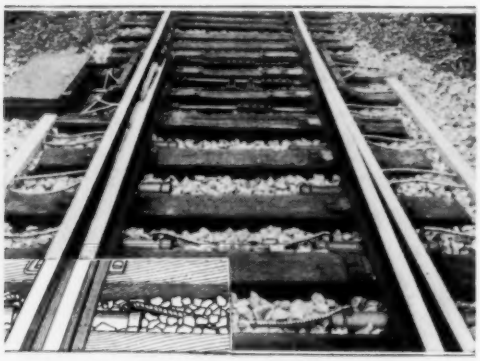
Huge Cranes, Now Disused, That Picked Up Giant Logs of Spruce and Placed Them on Flat Cars with Ease, Are Conspicuous Even among the Biggest of Machines



There Is $10,000,000 Worth of Spruce-Logging Machinery in This Government Assemblage, Most of It Practically New. It is being Carefully Sorted and Catalogued for Future Sale, So That the Loss may Be as Small as Possible

ELECTRIC HEATERS KEEP SNOW FROM RAILWAY SWITCHES

That old-time bugbear of railroad men, the clogging of switches and frogs by



Electric-Heating Coils in Sections of Iron Pipe under the Rails Keep the Switch Clear of Snow in All Weather

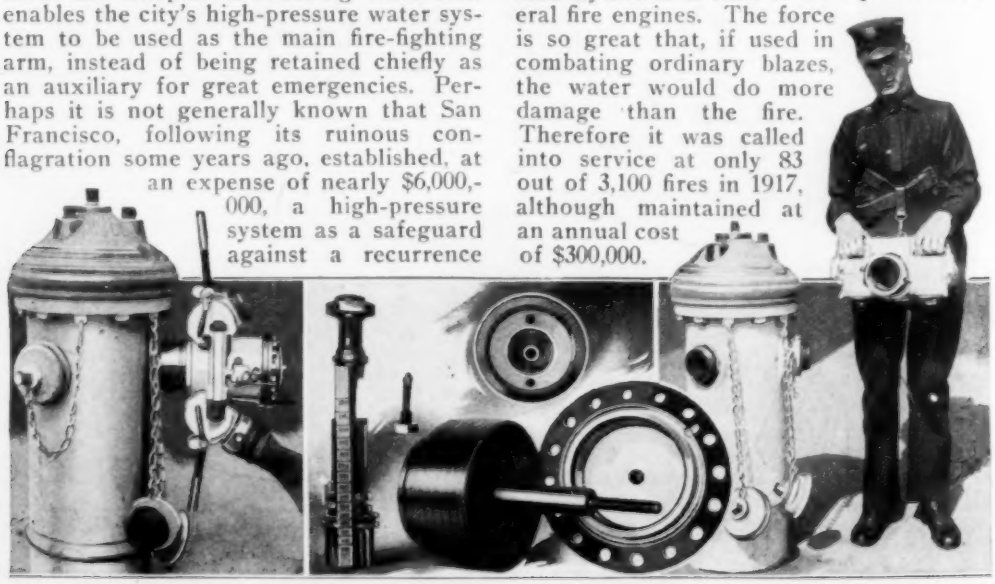
snow, is banished by a device now in use on an eastern road. Just beneath the rails of the switch, in the spaces between the ties, electric heaters are installed and connected to a current cut-off at any convenient point. Each heater consists of a coil of resistance wire inclosed in a 3½-in. wrought-iron pipe, 20 in. long. A temperature rise of 180° F. is attained in half an hour, with a further rise of 63° in an hour. This thaws the frozen ground so that the snow melted from the rails drains into it.

FILMS REPLACING PLATES FOR ARMY X-RAY WORK

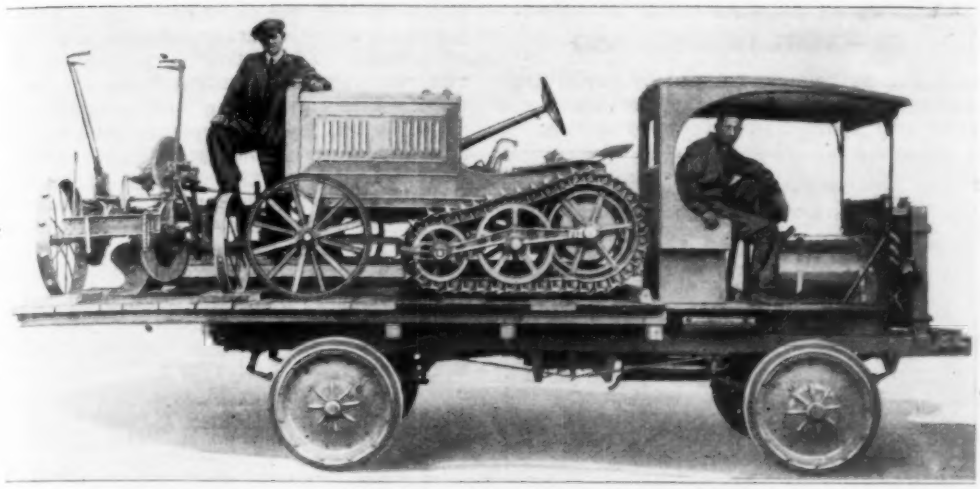
In pre-war times, when the amount of breakage was small and the weight of shipments was not an important factor, the use of plates in X-ray work was extensive. But the necessity of sending large supplies to France and the carrying on of X-ray work under field conditions soon caused them to be replaced by films. The use of films in automobile surgical units made it possible to X-ray wounds as soon as received, which was of especial advantage in army medical work. The sudden cessation of hostilities, however, left the medical department with large quantities of film on hand, and in order to dispose of it, the surgeon-general has ordered the use of film in this country in place of plates.

SIMPLE PRESSURE REDUCER FOR FIRE HYDRANT

Of late the San Francisco fire department has adopted a reducing valve that enables the city's high-pressure water system to be used as the main fire-fighting arm, instead of being retained chiefly as an auxiliary for great emergencies. Perhaps it is not generally known that San Francisco, following its ruinous conflagration some years ago, established, at an expense of nearly $6,000,000, a high-pressure system as a safeguard against a recurrence of such a disaster. One of the high-pressure hydrants is said to be equal to several fire engines. The force is so great that, if used in combating ordinary blazes, the water would do more damage than the fire. Therefore it was called into service at only 83 out of 3,100 fires in 1917, although maintained at an annual cost of $300,000.



A Reducing Valve Allows San Francisco's High-Pressure Water System to be Used for the Fire Department's Everyday Work. The Valve is Seen Mounted on a Hydrant at the Left. In the Center Are the Piston and Valve with the Pressure-Indicating Rack. The Fireman Supports the Valve with a Strap When Connecting It



The Big Motor Truck Carries the Tractor and Plow to Any Farmer Who Wants a Demonstration, a Special Platform being Fitted to the Truck, and Four Three by Twelve-Inch Planks Used as a Loading Runway

The new pressure-reducing valve enables water to be taken from the heavy-duty hydrants at whatever pressure the occasion dictates. It is operated hydraulically. Heavy springs and delicate mechanism, customarily utilized in such automatic valves, are not embodied in it.

In brief, the apparatus consists of an ingenious arrangement of internal chambers, a piston valve at the intake, and a governing spring-operated needle valve fitted with an indicator and graduated rack. The piston has a central bore that permits high-pressure water to flow to a chamber at the top of the casting, from which its passage to a control chamber is regulated by the needle valve—set to hold any desired pressure. It is essentially the variation of pressure between that in the latter chamber and the discharge and back-pressure chamber that actuates the piston valve.

CONCRETE PUT TO NOVEL USE IN SHIP REPAIRING

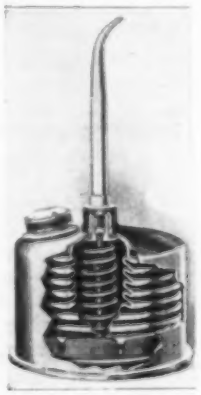
What may prove to be a new era in ship repairing has been inaugurated by a Buenos Aires firm. A wooden vessel of some 200 tons displacement, with ribs quite rotted away at the bottom, was reinforced by new concrete ribs being cast between the existing wooden ribs. These were secured to the skin of the vessel by means of screws being driven into the latter and the concrete set around them. The concrete also serves as ballast, hence nothing is added to the weight of the vessel. The repair was quite successful.

DEMONSTRATING FARM TRACTOR CARRIED ON TRUCK

When a farmer in his district is ready for a demonstration, a tractor distributor in Salt Lake City simply loads the tractor and plow on a big motor truck and goes out to the field. Four 3 by 12-in. planks, which are taken along, make a runway up to the truck platform, specially built for its unusual burden. This outfit can stage several demonstrations a day, and the "show me" method proves to be a convincing sales argument.

NEW TYPE OF OILCAN HAS BELLOWSLIKE RESERVOIR

In an attempt to overcome faults in common oilers, an oilcan has been designed having a body of heavy steel, within which is an oil reservoir in the form of a brass bellows. This is kept expanded by a coil spring extending from the bottom to the spout. Oil is ejected by pressing a button on the underside of the can. At the lower end of the spout is a ball check permitting the flow of only a limited amount of oil with each compression of the bottom, thus eliminating one cause of waste.



AERIAL POST CARRIES WOMAN IN REGULAR MAIL BAG

A live parcel was carried by aerial post as regular mail on a flying postman's recent trip from San Diego to Riverside,

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A Young Woman of San Diego, California, Stepped into a Mail Bag and was Sent by Aerial Post to Riverside, 90 Miles Away, the First Human Parcel Carried by a Flying Postman

Calif. Miss Virginia Brassac, a resident of the former city, occupied the mail bag and won the distinction of being the first to travel under that classification. Rockwell Field was the starting point of the flight.

NEW PHOTOMETER MEASURES LIGHT VARIATIONS

Designed primarily for the purpose of measuring the illuminating value of flash lights, flares, star-shell compounds, and other similar compositions, a photometer originated by a member of the Illuminating Engineering Society of England is of especial interest. It consists of a tube, 25 in. long and 3 in. in diameter, with interior whitened and illuminated by a small electric lamp at one end. Extending nearly the whole length of the tube is a 2-in. slot, which is covered by a thin metal strip with perforations in the form of letters. This strip is painted white and receives the illumination to be measured. The tube being brilliantly illuminated at one end, the perforations at that end appear to be brighter than the strip illuminated from the outside, and those at the other end darker, and a point can be approximated where the interior of the tube is as bright as the exterior strip, thus giving a basis for comparing the known illuminating value of the glow lamp in the tube with that of the outside illumination; that is, the flash light, flare, or other source of light under test.

NEW BRIDGE OVER THE TIGRIS A MARVEL OF ENGINEERING

Named after the late Lieut. Gen. Stanley Maude, K. C. B., a new bridge erected by the British over the river Tigris at Bagdad has just recently been thrown open to traffic. Because of the many peculiar conditions this bridge had to fulfill, its designing and construction in seven months is nothing less than marvelous. The bridge had to be capable of bearing the heaviest piece of ordnance being used in Mesopotamia; of automatically taking up the rise and fall of the river; of withstanding the force of its floods, which reach a height of over 20 ft. and travel very fast, and of opening and closing for the passage of river craft with a minimum delay to traffic. The main portion of the bridge, which is 1,159 ft. in length between abutments, is carried on steel pontoons which work in vertical guides. The opening portion, 260 ft. long, is hinged to the girder portion on the left bank and opens upstream. It is operated by power-driven winding gear. The alteration in the length of the bridge, made necessary by varying river levels, is taken care of by ramp girders, the space between them being bridged by a sliding cover plate. To guard against destruction by floods, very heavy mooring appliances are employed both up and downstream.

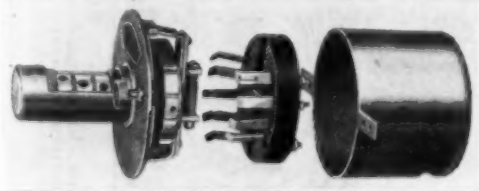
¶ To supply the needs of Vienna, a hydroelectric power plant has been erected on the Danube—the first in Austria. The power will be obtained by means of a dam, and the station will have 17 turbines capable of developing from 70,000 to 170,000 hp., depending on the water level.

SCRAP COPPER TO BE SALVAGED FROM EUROPEAN BATTLE FIELDS

When the well-known dogs of war were finally run into their kennels after four years of romping over the greater part of Europe, one of the big questions put up to the experts was, how much of the copper could be salved and made use of. It is estimated that France and Belgium alone have in excess of 3,000,000 tons on their various battle fields, of which probably 1,000,000 tons can be recovered. This is about equal to one year's output of the United States. In addition to this, there are large quantities in Russia, the Balkans, and Italy. Germany is practically denuded of copper, notwithstanding the fact that she went to particular pains to stock up on this metal for several years prior to the war.

MULTIPLE SWITCH DESIGNED AS KEYLESS AUTO LOCK

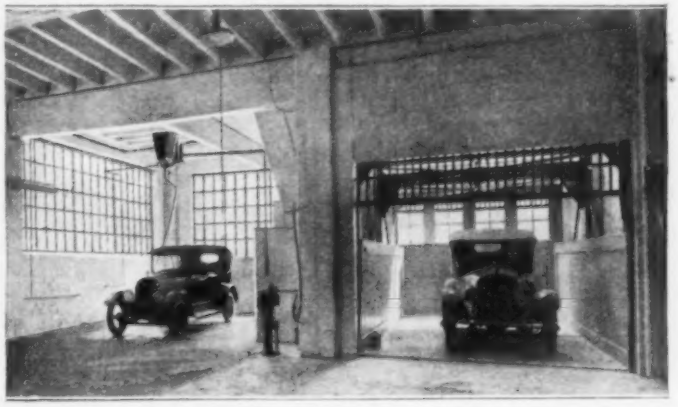
One of the season's new motor-car locks has been designed on the theory that few automobiles are stolen by expert electricians. The device consists of a simple combination lock and multiple switch, assembled in a compact unit, with its mechanism inclosed in a steel housing mounted within the cowl. It controls the entire electric equipment of a car, but allows the tail and dash lights to be operated independently, if desired. The combination may be changed at will, and its use, of course, eliminates the nuisance of the misplaced key or the possibility of a duplicate.



This Locking Switch Controls the Ignition and Lighting Circuits of a Car, Making Theft Difficult. The Combination can be Easily Changed

AUTOS GET SHOWER BATH IN THIS REPAIR SHOP

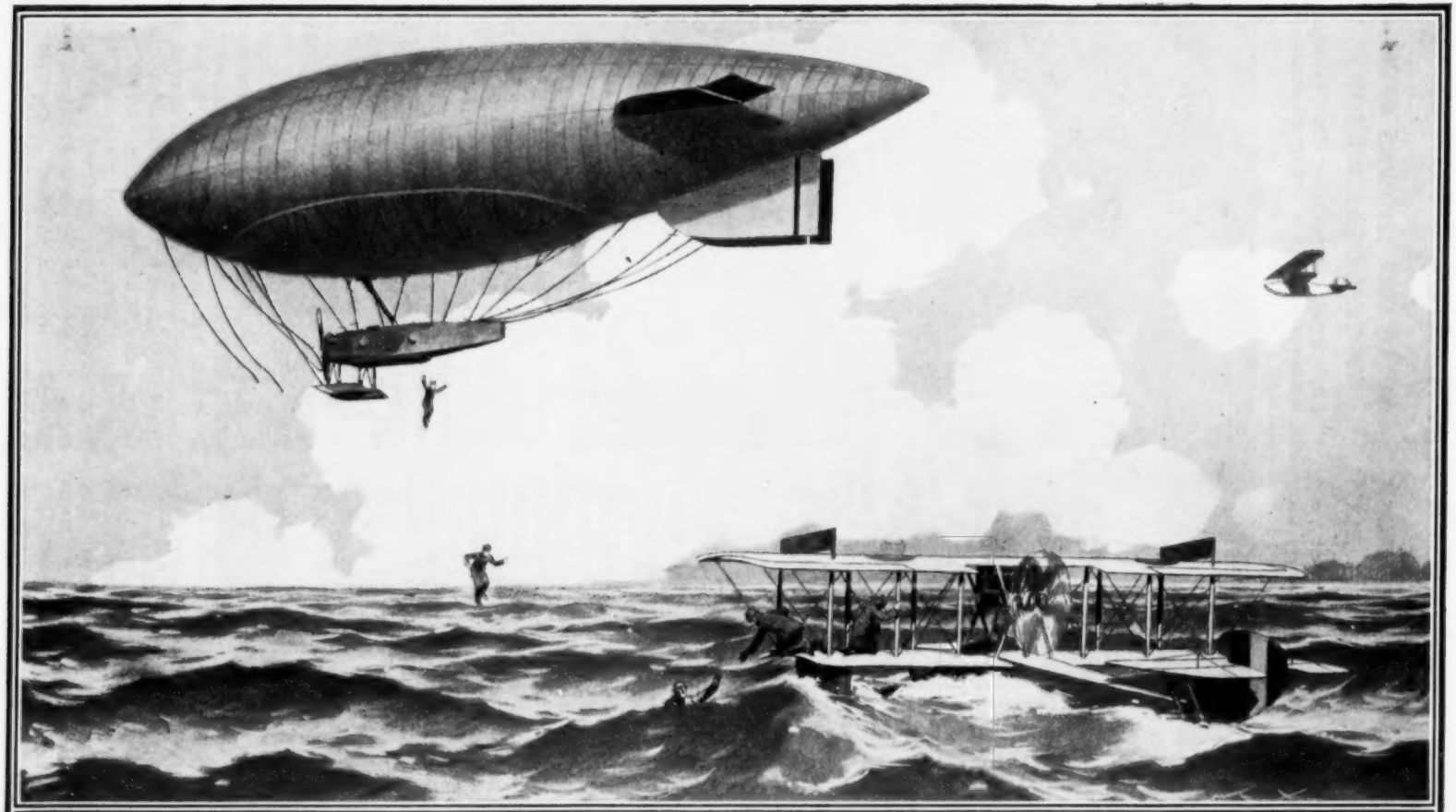
When an automobile is first brought for attention into the repair department of an Indianapolis car factory, it is given the same treatment often accorded to other "knights of the road" on entering a lodging house. A shower-spray arrangement attached to the shop ceiling thoroughly washes down the dusty wanderer until, clean and fresh, it is sent to the elevator and carried upstairs to the workroom.



The Object Depending from the Ceiling Just over the Car at the Left Is a Shower Spray, Which Quickly Removes Dust and Dirt. After Its Bath It Takes the Elevator at the Right

CONCRETE RAILWAY SLEEPERS GIVE GREATER RESILIENCY

An Italian railway constructor has recently devised and tried out, on a railway running between Asti and Altavilla, a series of interlinked sleepers of reinforced concrete. These are triangular in shape and are arranged lengthwise beneath each rail. As each of them rests on a pedestal with the center of its base, it is the claim of this constructor that they are capable of a rocking motion which gives a certain resiliency to the rail. Each sleeper supports the rail at two points, and here a block of wood is used as a cushion, with a bolt for anchoring the rail to the sleeper. The rails are held to gauge by means of tie-rods. These tie-rods are fastened to the rail by clamps that grip the base, thus doing away with the necessity of drilling the rail. Unevenness of track level may be rectified by changing the height of the wooden cushions between the rails and the sleepers. Maintenance expense is comparatively small.



DIVE FROM BALLOON INTO SEA IS UNPLANNED FEAT OF FOUR OFFICERS

HIGH diving from a balloon undeniably has a sporting flavor; but it was with no athletic intent that four officers from the Naval Aviation Camp at Chatham, Mass., performed the spectacular feat. In mid-air their engine became hopelessly stalled and the big craft started out to sea. Desperate maneuvering brought it low enough for a daring leap to the water. Then, while a following seaplane rescued the men, the big bag soared away in the distance.

NEW STANDARD-TIME ZONES ESTABLISHED BY LAW

The establishing of new standard-time zones by the Interstate Commerce Commission the first of the year, as provided by law, has caused the resetting of many timepieces in cities on or near the altered dividing lines. The western boundary of the eastern zone, for most of its length, has been moved westward, as the accompanying map indicates. The new line dividing the central and mountain zones now follows the 100th meridian in place of the old and very irregular boundary. The plan of the commission is that all towns directly on this meridian shall use central time. This applies also to the majority of the municipalities on the eastern border of the central zone. Practically the whole of Utah, Idaho, and Nevada, and nearly half of Montana have been transferred from the mountain zone to the Pacific zone. The old boundaries were never recognized as official by the government, but the new ones are.

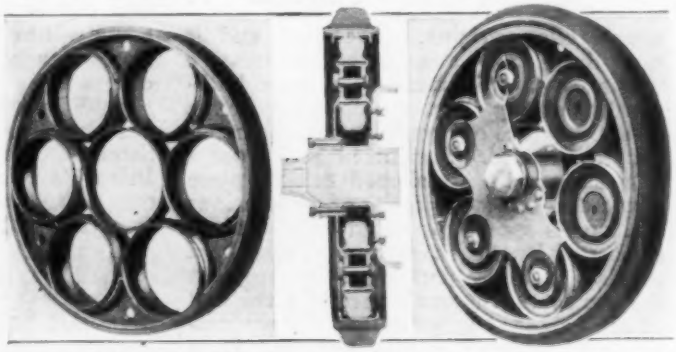
The Eastern Time Zone has been Extended Westward, as the First Heavy Line from the Right Indicates. Between Central and Mountain Zones the Boundary Now Follows the 100th Meridian. The Pacific Zone Takes In Practically All of Utah, Idaho, and Nevada, and About Half of Montana

THREATENED POWER SHORTAGE OFFSET BY CONSOLIDATION

The development of a situation which for a time threatened to cause a serious loss of power to California industries has just been averted by the consolidation of three large hydroelectric systems. By this means electric power manufactured near the California-Oregon line is transmitted continuously for a distance of 300 miles to the industrial region around San Francisco Bay. There has heretofore been a large surplus of power in the northern part of the state which was unavailable, and it is expected that approximately 60,000,000 kw.-hr. of power will be brought annually from there to the rapidly increasing industrial districts of middle California. This will, in turn, bring about the saving of some 20,000 bbl. of oil, which is now being used for the generation of power. Industries of central California are thus assured of development unhampered by lack of adequate motive power.

HEAVY TRUCK WHEEL FLOATS ON RUBBER CUSHIONS

Adding to the resiliency of the solid-rubber tires used on motor trucks is an attractive field for the exercise of ingenuity. Most of the attempts, however, depend upon steel springs, which in this connection are apt to be a source of trouble. The steel framework of a new type of truck wheel is supported by six round rubber cushions which, with their inclosing rings, fill the space between the regular ring of the wheel and the center

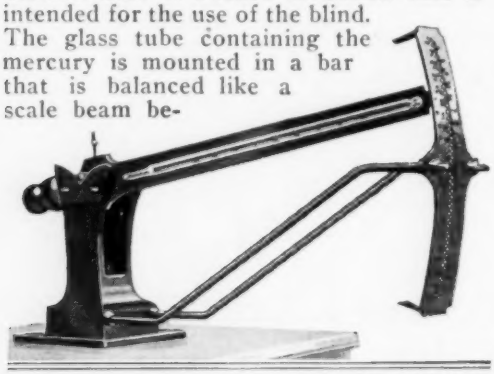


At the Left Is the Steel Frame of the Wheel, Before the Cushions are Inserted. In the Center Is a Section through the Vertical Diameter of the Finished Wheel, Showing How the Axle Is Floated on the Rubber Cushions, While the View of the Complete Wheel at the Right Gives an Idea of Its Appearance

or hub ring. Side plates in the form of solid spiders bolt to the center of each rubber cushion and are seated on the hub. The axle has no connection with the frame of the wheel except through the rubber cushions, making, in automotive parlance, a "full-floating" wheel. As the entire periphery of each cushion is inclosed by the frame, resilience is offered to shocks from any direction and pressure is distributed around the rim.

NOVEL THERMOMETER FOR THE BLIND

Marked simplicity is one of the outstanding points of interest found in a thermometer of French invention that is intended for the use of the blind. The glass tube containing the mercury is mounted in a bar that is balanced like a scale beam between two uprights. The bulb end is near the axle. Thus, as the temperature drops, causing the mercury to move bulbward, the beam rises. An opposite change of temperature obviously causes the member to descend. Supported at its outer extremity is an arc-shaped flexible piece of metal that bears a series of perforations and on its face is provided with graduations and Braille characters. To make a reading, a blind person presses against the arc so that a small needle at the end of the balanced beam enters the perforation with which it is in alinement. Then locating the latter by touch, and translating the characters opposite it on the arc-shaped dial, the temperature is determined.



BY COURTESY OF LA NATURE

An Ingenious Thermometer of Marked Simplicity Intended for Persons Who Are Blind

¶Canada's Royal Northwest Mounted Police, celebrated in fact and fiction, are to be reorganized on the pre-war basis of 1,200 men. The "Scarlet Riders," as they were also called, were almost disbanded by wholesale enlistment of their members in the overseas army.

OFFER BIG PRIZE FOR ESSAY ON WORKERS AND WAGES

A thoughtfully prepared essay on one of the subjects outlined here may win a good prize for its author. The donor is the National Industrial Conference Board, and the contest is open to everybody except, of course, persons connected with the board. No limit is placed on the length of any paper, although contestants are urged not to be unduly expansive. The prize is $1,000 for the best monograph on any one of these topics:

1. A practicable plan for representation of workers in determining conditions of work, and for prevention of industrial disputes.
2. The major causes of unemployment and how to minimize them.
3. How can efficiency of workers be so increased as to make high wage rates economically practicable?
4. Should the state interfere in the determination of wage rates?
5. Should rates of wages be definitely based on the cost of living?
6. How can present systems of wage payments be so perfected and supplemented as to be most conducive to individual efficiency and to the contentment of workers?
7. The closed union shop versus the open shop: their social and economic value compared.
8. Should trade unions and employers' associations be made legally responsible?

Each competitor is to sign an assumed name to his paper and send his real name and address separately in a sealed envelope with the assumed name written on it. Especial weight will be given to composition and skill in handling the subject, and the copyright on the prize-winning essay will be retained by the board, which may arrange with authors for the use of others not awarded a prize. Manuscripts should be addressed to the National Industrial Conference Board, 15 Beacon Street, Boston, Mass., and marked "For Prize Essay Contest, in Industrial Economics." They must be mailed on or before July 1, this year.

ANY CIVILIAN MAY FLY NOW IF QUALIFIED

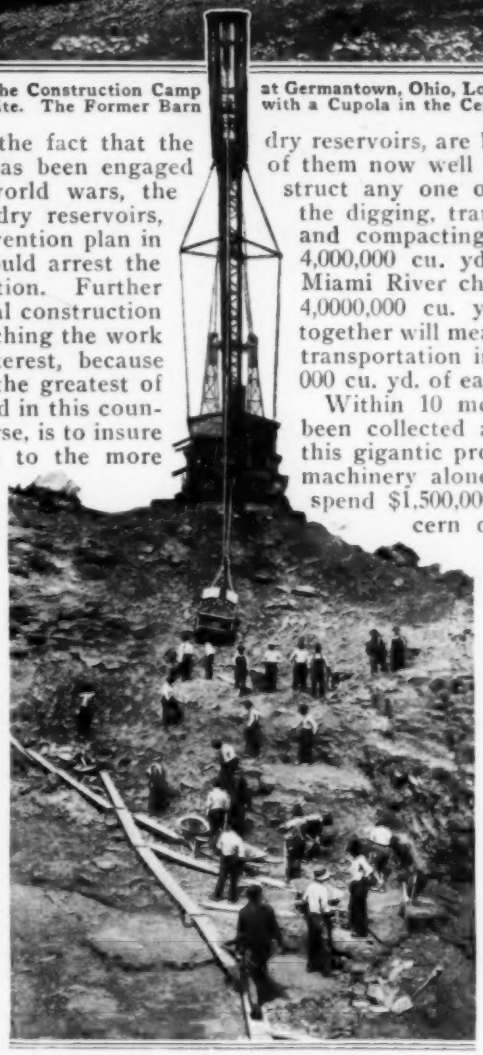
Any civilian who is ambitious to join the ranks of the peace-time fliers, professional or amateur, now has only to prove his qualification and he can get a permit. Military restrictions no longer apply to the licensing of civilian pilots under the presidential proclamation of Feb. 28, 1918. Applications are handled by the Joint Army and Navy Board on Aeronautic Cognizance, Building D, Sixth and B Streets, Washington. Lieut. L. G. Haugen is secretary of the board.

BIG DRY RESERVOIRS TO PROTECT MIAMI VALLEY AGAINST FLOODS

BY HOWARD EGBERT

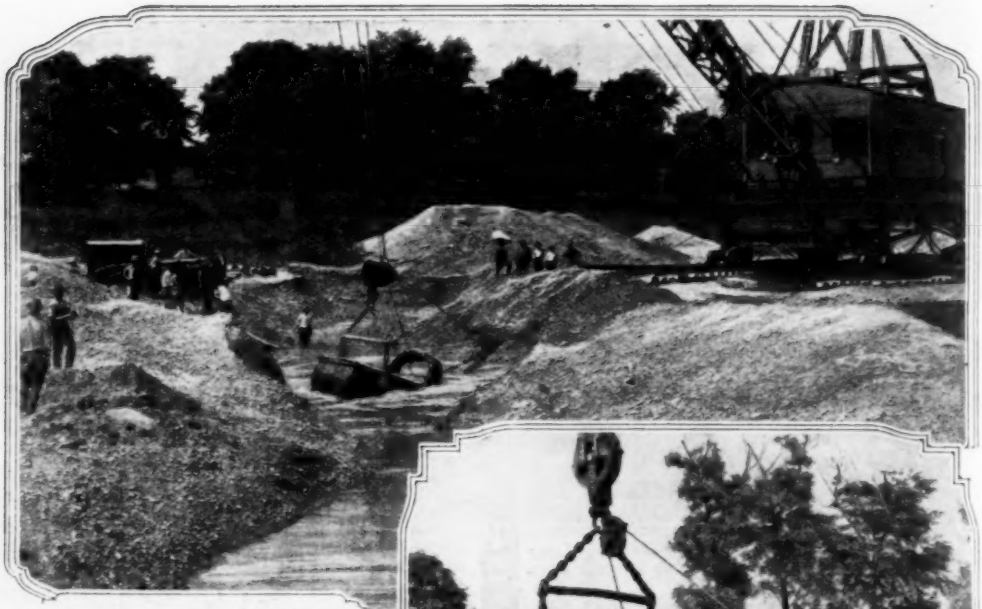
This Little Settlement Is the Construction Camp at Germantown, Ohio, Looking East from the South End of the Dam Site. The Former Barn with a Cupola in the Center Is the Office

WERE it not for the fact that the United States has been engaged in the greatest of world wars, the building of the five dry reservoirs, as part of a flood-prevention plan in the Miami Valley, would arrest the attention of the nation. Further than that, international construction experts would be watching the work with considerable interest, because the project is by far the greatest of its kind ever attempted in this country. The plan, of course, is to insure permanent protection to the more than 700,000 inhabitants living in the Miami conservancy district, a region following closely the Miami River, an important but not navigable waterway which threads its way through southern Ohio counties. The cost is estimated at $20,000,000. More than 2,000 men are required to complete the construction work, and three years as a minimum is the length of time estimated as necessary to carry out the designs of the district. Five huge retention basins, or dry reservoirs, are being constructed, all of them now well under way. To construct any one of these dams means the digging, transporting, depositing, and compacting of from 850,000 to 4,000,000 cu. yd. of earth. For the Miami River channel the estimate is 4,0000,000 cu. yd. Dams and river together will mean the excavation and transportation in all of some 13,000,000 cu. yd. of earth.

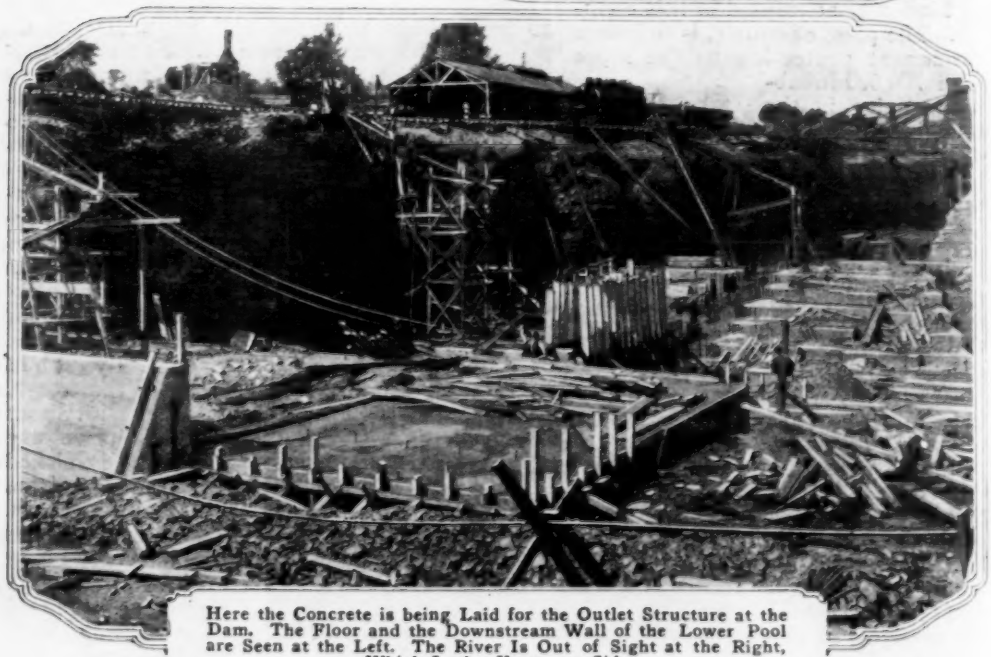


Beginning Work on One of the Dry Reservoirs with an Electric Drag-Line Excavator

Within 10 months, machinery has been collected and work started on this gigantic project. For the larger machinery alone it was necessary to spend $1,500,000. The chief concern of the engineers who planned this undertaking was machinery for excavation and transportation. The hydraulic dredge was selected as the most suitable means for work along the river. By this method the earth, together with about 10 times its volume of water, is picked up by the suction of the dredge pump. The mixture is lifted by the pump to the desired point, the water permitted to run away, leaving the earth. For the greater part of



The Picture Above Shows How the Drag Line is Used in Digging a Trench—in This Case in the Bed of the Miami River, at Dayton, Ohio. The Bucket is Manipulated to Build a Dam on Each Side and across the River End of the Trench. At the Right Is One of the Big Buckets, Held Erect by Its Hoisting Cable. This Is a Four and One-Half Yard Bucket



Here the Concrete is being Laid for the Outlet Structure at the Dam. The Floor and the Downstream Wall of the Lower Pool are Seen at the Left. The River Is Out of Sight at the Right, Which Is the Upstream Side

A Swift Rise of Water, Characteristic of the Miami River, Caught This Drag-Line Machine and Serves to Illustrate the Hazards of the Work. These Drag Lines Pull Up Three Wagon Loads of Earth at a Time

The Huge Structure across the Stream Is a Concrete Mixer at Work on Material for the Reservoir Basins and Retaining Walls. The Supply Railroad Runs along the Other Side of It, and a Conveyor Takes the Material up the Incline

The Track Which Stretches Away into the Picture was Built to Bring In the Machinery and Materials for the Dam. The Inclined Platform Leads to the Top of the Gravel-Washing Plant. Gravel from the Cars Goes into the Hopper at the Bottom and up a Conveyor Belt

the excavation drag-line excavators were adopted. These are electrically driven and have thus far proved their efficiency. Practically every electric drag line available in the United States was bought up for this construction work. Engineers, in one instance, had to wade through four feet of snow in northern Michigan to find a suitable electric drag line available in that section. To get it to a railway and ready for shipment to Dayton, Ohio, a gang of men shoveled snow, six feet deep, for four days for a quarter of a mile with the thermometer 35° below zero. Two machines were lifted from swamps in southeastern Mississippi. In all, 18 excavators of this type were bought at an expense of $425,000. Eight of them are operated by steam.

In carrying on the work, six small three-ton gasoline locomotives, of 24-in. gauge, for handling concrete in making the dry reservoirs, or dams, were purchased, and to be used with these, 81 standard 12-yd. dump cars were taken over. For the concrete itself, a dozen hopper cars were found necessary. To carry water for the hydraulic fill at the dams, 12,000 ft. of steel pipe will be required. Five gravel-washing plants were erected at the sites of the five dams, and special electric lines had to be built from a Dayton plant to furnish the motive power for operating the machinery. The buckets used with the drag-line excavators are more than 6 ft. long by 4 ft. in width.

The flood-conservancy project consists of the dry-reservoir system, which, once constructed, will occupy five different tracts of land in the district. At unusual periods of high water, it is designed to permit all overflow water to run into these basins. They will be so stoutly constructed that they cannot break under pressure of millions of gallons of water. The river channel, thus relieved of the additional burden of high water, will not be threatened, and the customary danger of banks breaking or overflowing is entirely eliminated. The dry-reservoir plan was originated by chief engineer Arthur E. Morgan, who has worked on the project with a corps of assistants since 1913. One of his chief aids is Charles Paul, who built the great Arrow Rock Dam in the West.

A feature of the work is the purchase by the conservancy district of the village of Osborn, in Greene County. The entire population will soon have to move, because the village occupies the site of an important part of the flood-prevention work. This is the first time in the country's history that a project has been large enough to warrant the purchase of a village of 500 inhabitants. Railroads and traction lines have been obliged to move their tracks in keeping with the plans.

The Foreground Is Level Bedrock, Which Needs Only to be Washed Clean, and the Heavy Concrete Walls, Going Up in the Background, are Built Directly Upon It, 82 Feet High

It will require as much concrete to complete the dams as was used in the building of the Panama Canal. One hundred skilled engineers are being employed. Charles H. Locher, a construction engineer of national prominence, is in direct charge of the entire construction work. Scores of cottages, and also schoolhouses, have been erected at the various dam sites for the workmen and their children.

CONCRETE TRACK BASE WITHOUT BALLAST

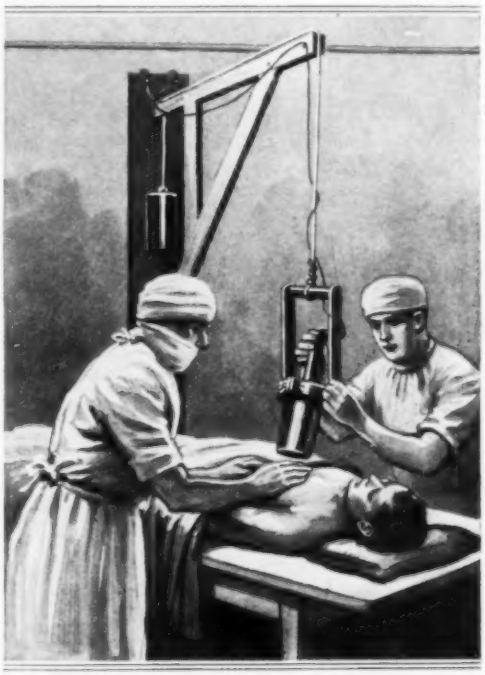
A concrete track base is being successfully used without ballast, on a short stretch of open main line, by a western railroad. A continuous concrete slab, 8 ft. wide, with wood cushions for the rails, is the salient feature of the arrangement. The thickness varies, for experimental reasons, from 16⅜ in. to 24 in. Also as an experiment, both continuous timber bearings and short wood blocks were used under the rails on different sections. The concrete was molded in bottomless forms on the well-tamped roadbed, at a point where it runs through a gravel cut, and no ballast was used. The wood cushions for the rails are screwed to wood sills, imbedded in the concrete. Although the concrete base is continuous with the track, 9/16-in. expansion joints, cushioned with asphalt, are provided by molding the slabs in lengths of 16 ft. 5½ in. The ends of the slabs are mortised to guard against side shifting. It is agreed that the concreted track rides more easily than adjacent tracks of usual construction, and maintenance is low.

NIGHT GOGGLES FOR AUTOISTS DIM GLARE OF HEADLIGHTS

Special goggles have recently been invented for the convenience of motorists who, driving at night, are frequently blinded by the glare of lamps of passing cars that are undimmed. A portion of the left-hand part of each lens in these goggles is colored, and when the wearer approaches a blinding light, he has only to turn his head slightly and the rays are dimmed by the shaded portion of the glass, while the remainder of the field of vision is viewed through clear glass.

PIECES OF SHELL IN WOUNDS LOCATED WITH VIBRATOR

Locating pieces of shell, or the like, in a wound is much facilitated by using an electric vibrator, recently developed in France and said to possess advantages over X-ray apparatus employed for similar purposes. The vibrator is suspended by a cord passing through a pulley at the end of a swinging arm, so that it can be brought directly over the operating table and raised or lowered as desired. It is operated by an alternating current or, where that is not available, a commutator is employed, and a quick-action interrupter is also necessary. As the examining surgeon moves his hands over the flesh in the vicinity of the wound the vibrator is held close to the back of his hands by an attendant. When the surgeon's fingers touch a place close to the imbedded fragment he feels a distinct vibration of the muscles.



The Surgeon Moves His Hands over the Patient's Body, and the Electric Vibrator Aids in Locating Imbedded Steel Fragments by Its Magnetizing Effect, Which Causes the Overlying Muscles to Vibrate

¶According to recent action of the French government every discharged poilu is to have his steel helmet as a permanent souvenir of his part in the war.

CONCRETED EARTHEN BASIN BIG OIL RESERVOIR

Shortage of steel has caused reinforced-concrete to be used in the construction of a 350,000-bbl. oil reservoir near Gainesville, Tex. The type is found in California fields, but is new in Texas. It consists of a circular basin floored with three inches of wire-strengthened concrete and covered with a concrete roof supported on timber posts and girders. The bowl was provided by making a 5-ft. excavation to a limestone stratum, and throwing up an earthern embankment, 17 ft. in height. By tying together the wiring in the roof and slope slabs, and connecting the pipe lines likewise with the roof reinforcing, precaution has been taken against fire being caused by lightning.

Picturing the Great Reservoir in the Course of Construction Prior to the Erection of the Roof Supports: The Bowl Holds 350,000 Barrels of Oil

The Photograph Above was Taken When the Roof of the Storage Basin was Nearing Completion. The Reinforcing Wires in the Cover and Slope Slabs are Tied Together and Also Connected with the Pipe Lines as a Precaution against Fire being Caused by Lightning

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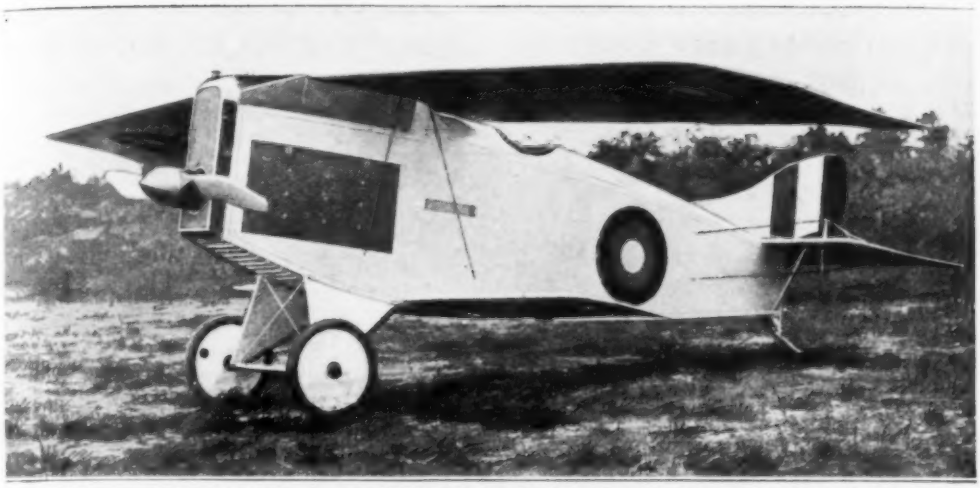
¶The Dutch government has contracted for a powerful radio station which will enable Holland to communicate by wireless with Java, a Dutch possession, which is to have a sister station.

SMALL OUTPUT AND BREAKAGE MAKE SHORTAGE IN DISHES

A war hardship which America escaped by a narrower margin than has been generally realized was a pronounced scarcity of china and porcelain ware for table use. Had the war continued for some months longer many low-priced restaurants probably would have been forced to use enameled or paper dishes. Two factors brought the market in this country to this critical condition, which has not been altogether relieved by the signing of the armistice. On the one hand, production was greatly curtailed in France and to a less degree in England, and many shipments were sunk on their way to this country. Many firms found that it took a year or more to get orders filled in England, while formerly it had taken about six months.

The second factor contributing to the shortage was the increased breakage due to inefficient help in hotels and restaurants, and also to inferior quality of material. Even the normal breakage in public eating establishments is so great as to appall one unfamiliar with the business. The manager of one of the largest concerns in the country operating a chain of lunch counters and restaurants found that when help was most difficult to obtain the breakage ran away above normal. Of late the condition has improved somewhat, but still the breakage loss has been in the vicinity of $4,000 per month. While this concern had less delay than many in receiving shipments from England, the general shortage was reflected in prices it paid. Cups that formerly cost $1.35 per dozen rose to $2.90 per dozen. Butter chips which once cost 18 cents per dozen have been selling for 80 cents per dozen, while glasses that were 35 cents per dozen advanced to 95 cents.

In a typical Chicago cafeteria, when



The Fastest Thing with Wings: The Christmas "Bullet," a Strutless Biplane That has Developed a Speed of 195 Miles an Hour in Flight. Both in Design and Performance, This Is One of the Most Striking Aeroplanes of American Invention

help was hard to obtain, the breakage mounted to $8 per day. Now, with prices not materially different, the grade of help is improved, and breakage has been reduced to $5 per day. One of the leading clubs of the same city finds its breakage bill now averaging $15 per day, as against $8 before the war. The club manager rates his help above the average and attributes this increase almost wholly to higher prices. While conditions throughout the country are still far from normal, dealers no longer fear that enameled ware and paper cups will have to be resorted to.

FLEXIBLE, STRUTLESS BIPLANE TRAVELS AT ENORMOUS SPEED

From the standpoint of the spectacular, there is nothing in the aeronautical world that can approach a new American biplane known as the Christmas "Bullet." It is the fastest thing with wings, and in many ways the most astonishing. In flight it has attained the tremendous speed of 195 miles an hour—which is about 50 miles an hour swifter than the record-breaking Loening monoplane.

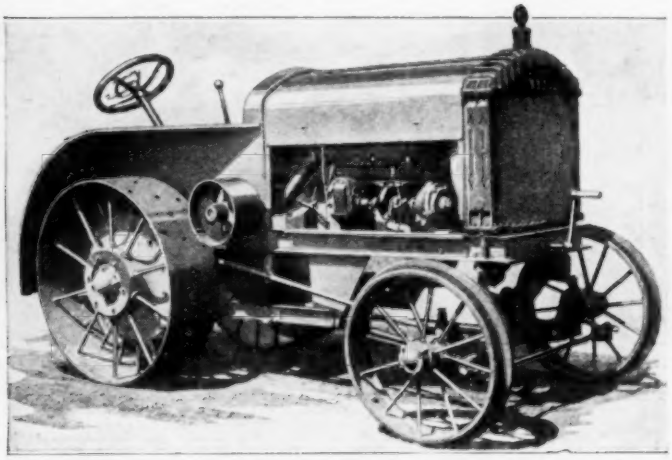
In design, the "Bullet" is as daring as its performance is remarkable. It is absolutely strutless and does not even employ bracing wires. Its wings have almost birdlike flexibility. They are supple, resilient, and self-adjusting. They are able to bend in three separate planes, which supposedly allows the craft to maintain its equilibrium automatically in any kind of weather and makes it less subject to the racking effect which results in rigid machines when shocks are encountered in the air. When at rest, the wings droop in a negative dihedral, while in flight they can assume positive and negative amounting to 18 in. from horizontal in either direction. Obviously this gives the wing tips a 3-ft. range of flexibility, so that it is not departing from fact to describe their motions as birdlike.

Some of the "Bullet's" specifications are interesting. The span of the top plane is 28 ft., and that of the bottom one, 12 ft. The chords are 5 ft. and 2½ ft., respectively. The angle of incidence amounts to three degrees, the gap, 4 ft., and the length of the fuselage 17¼ ft. A six-cylinder Liberty motor of 185 hp. is used. The landing speed is 60 miles; three-quarter throttle speed, 175 miles, and extreme normal speed, 197 miles an hour. Contrary to what one might expect from performance, the machine is not light. It weighs, when loaded, 2,100 lb., which means a wing load of 12 lb. to the square foot.

An accident, which is reported to have killed the pilot and badly injured the plane some weeks ago during a test flight, would seem to indicate that the craft has a low factor of safety. The designer, however, makes claims to the contrary. Several machines of the type are being manufactured for foreign shipment, and the construction of a giant model, with wing spread of 180 ft., and four motors aggregating 3,000 hp., is planned for a nonstop transatlantic flight. It is to be a land machine, unequipped for making a descent at sea.

DOUBLE-REDUCTION PRINCIPLE USED ON CAPABLE TRACTOR

Interesting mechanical features are found in a tractor of recent introduction.



Motor-Car Control, Double Gear Reduction, and Direct Drive in Second, or Plowing, Speed Are Some of the Interesting Points of the New Tractor. The Rear Axle Construction Gives It a Gear Ratio of 50 to One

It is estimated, for instance, that the drawbar pull on direct drive is at least 20 per cent greater than that of other machines of similar horsepower. This advantage is gained through a patented rear-axle construction of double-reduction principle. The arrangement gives a gear ratio of approximately 50 to 1. A worm gear drives a jackshaft, whose pinions mesh with internal gears on the bull wheels. Every working part is in an oil and dust-proof housing. With a four-cylinder, 28-hp. motor, the tractor, weighing 4,500 lb., has a drawbar pull of about 3,000 lb. The transmission is of conventional type except that direct drive is in second, or plowing, speed. The latter is two and a half miles an hour, while high, or road, speed is five miles. The drawbar is of the swinging type and pivoted near the front of the chassis. This prevents the tractor from rearing when under heavy load. The belt speed of the pulley is 2,200 ft. a minute.

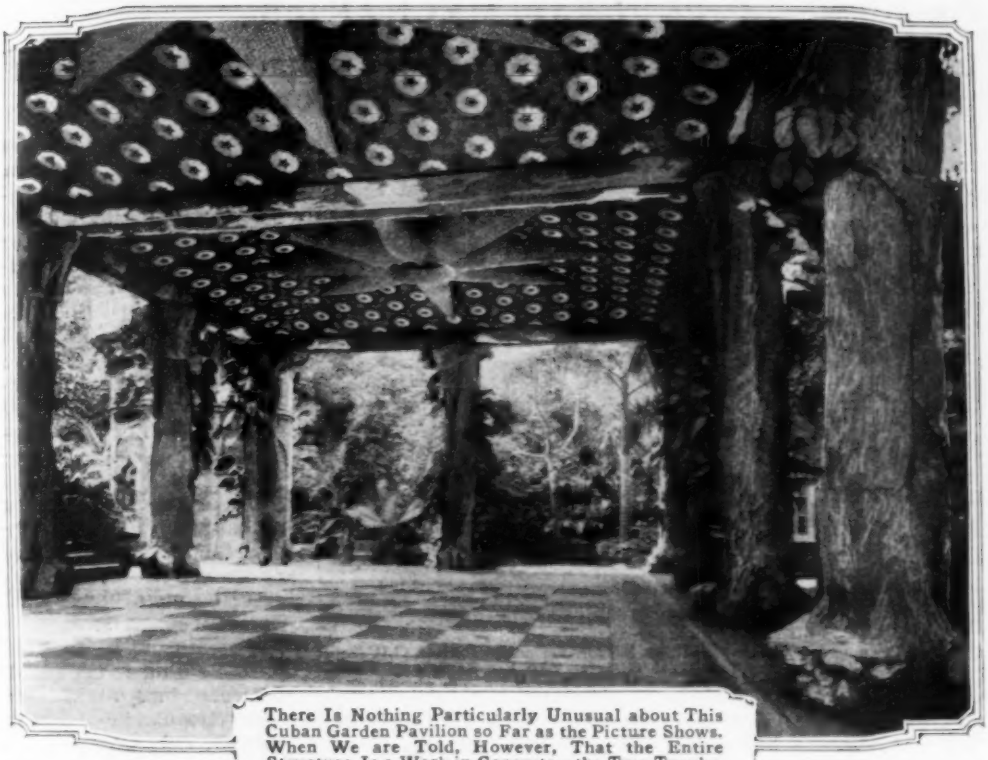
¶ In spite of the old adage to the contrary, some things done by halves are done most satisfactorily, as for example the much-used Quinsigamond bridge at Worcester, Mass. Here traffic suffered a minimum of interruption by completing and putting into use one longitudinal half of the new structure before the other half was built.

MINERAL VALUE TEN BILLION IN TWO YEARS

Value of mineral products of the United States for the last two years reached a grand total of over $10,000,000,000. Chief of these products are pig iron, copper, ferro-alloys, lead, zinc, gold, silver, and aluminum, with a figure of $2,091,825,000 in 1917 and over $1,895,000,000 in 1918; and the non-metallic products, coal, petroleum, clay, cement, and natural gas, reaching about $2,889,000,000 in 1917, and more than $3,265,000,000 in 1918. Alaska's share in this production was $28,900,000 in 1918 and over $40,000,000 in 1917, the falling off being due to shortage of labor, and shipping. Her coal output of 77,000 tons, however, broke all records and is taken to forecast a substantial Alaskan coal industry. The peninsula's chief mineral product, copper, was produced to the extent of 69,426,000 lb. in 1918. Her gold output of $6,100,000 was the smallest since 1904, due to the various influences of the war.

UNUSUAL GARDEN OF CONCRETE RENDEZVOUS AT HAVANA

Situated in the midst of rolling hills and tropical splendor, there has been built near Havana of late a recreation garden of singular character. Its oddity consists, not in the purpose to which it is put nor in the style of its architecture, but in the fact that it is constructed almost entirely of concrete. There would be nothing unusual in this were it not for the manner in which the concrete has been used. Inside and out the connecting structures are of rustic design and appearance. The heavy roof of the open-sided veranda, or portico, for instance, is supported by what seem to be the trunks of massive trees, but which in reality are concrete columns of praiseworthy workmanship. From its elaborately tessellated flooring to its inlaid starry ceiling, across which are heavy timberlike beams, it is executed in artificial stone. Only the big-leafed vines that cling to the imitation tree trunks, and the verdure without, are natural.



There Is Nothing Particularly Unusual about This Cuban Garden Pavilion so Far as the Picture Shows. When We are Told, However, That the Entire Structure Is a Work in Concrete—the Tree Trunks, Ceiling Beams, Decorative Inlay, and Everything Else—Its Novelty Becomes Apparent

This Is the Picturesque Entrance to the Garden, and despite Its Rustic Appearance, It, Too, is Built of Artificial Stone

Only the Big-Leafed Vines That Entwine the Concrete Trees, and the Greenery That Is Visible in the Background, Are Natural

MAKERS OF BIG BOSS PLATES DO RAPID WORK

A recent record for rapid work in connection with shipbuilding, of which a Vancouver, Wash., crew,

Crew of Vancouver, Washington, Men Which Recently Turned Out Eight Boss Plates in Five and One-Half Hours: The Big Sample of Their Speedy Work, Standing in Their Midst, Is for a 9,000-Ton Freighter

making boss plates, is very proud, consisted in turning out eight plates in five and one-half hours. Previously these men had hammered out two plates in a day, and it was thought they had done very well. Some idea of the labor involved in such production can be gained from the accompanying photograph.

FORTY-MILLION-POUND BLAST NARROWLY AVERTED

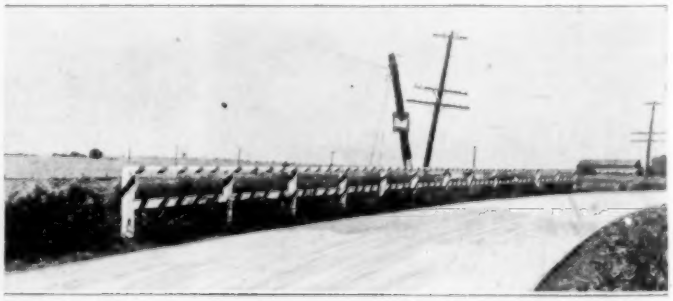
Two 500,000-lb. powder magazines set off by the explosion of a powder train, almost instantly followed by other magazines containing 39,000,000 lb. of explosive; the whole city of Philadelphia rocked as if by an earthquake, with enormous loss of life and property; that is one horror of war that America escaped by a scant 90 minutes. The government's big bag-loading plant at Washington Park, N. J., several times threatened by enemy agents, was placed under close watch by secret-service men. At 2:30 one morning a long powder train was shunted onto a siding in the plant, between two magazines. Men searched the train, and found strapped under a middle car, a time bomb loaded with TNT and set for 4:30 a. m. Under the floor of another car was a stick of dynamite wrapped in oil waste, whose tendency to spontaneous combustion was relied upon to act if the time bomb failed.

DISPATCH SERUM BY RUNNERS TO TOWNS IN FAR NORTH

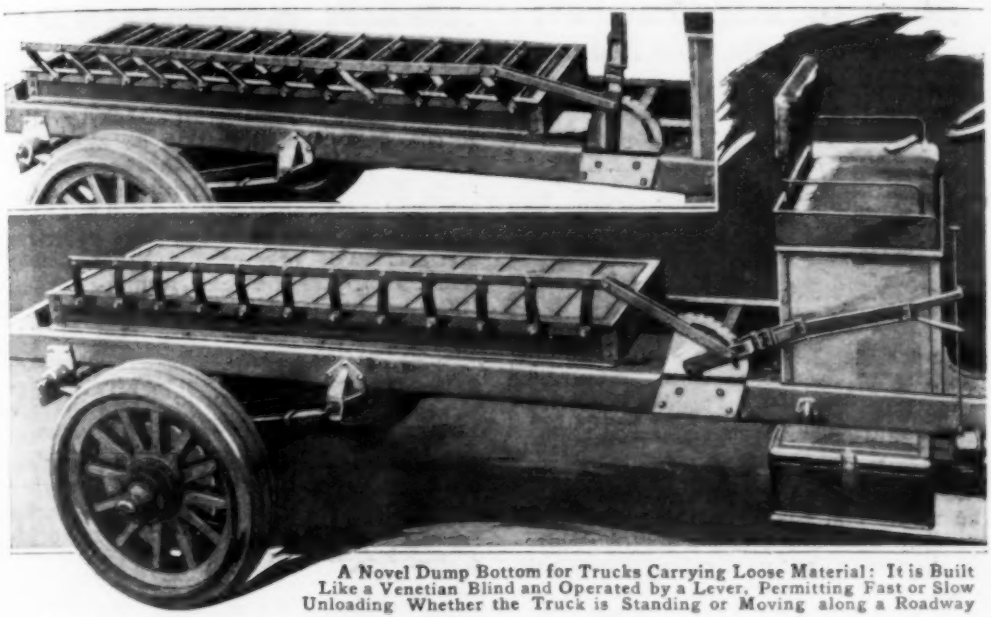
Word has recently been received of the heroic efforts made during recent months to check the influenza epidemic in Yukon territory, where remote communities faced grave danger because of limited medical and nursing supplies. To meet the emergency, Indian runners with dog teams were dispatched from Dawson with anti-influenza serum and sent across the snow as far north as Fort McPherson, near the mouth of the Mackenzie River, making the round trip of 1,000 miles in a little less than two months, which is a fair performance in midwinter. The journey included crossing the Rocky Mountains.

HIGHWAY CURVE GUARDED BY STRIPED FENCE

To make a guard rail along a concrete highway near Chicago doubly conspicuous, its white surface has been painted with diagonal black stripes. The barrier is located at the outer edge of a wide sweeping curve.



Motorists Speeding around This Curve in a Concrete Highway near Chicago, Day or Night, can Scarcely Miss Seeing This Guard Rail, Made Doubly Conspicuous by Diagonal Black Stripes



A Novel Dump Bottom for Trucks Carrying Loose Material: It is Built Like a Venetian Blind and Operated by a Lever, Permitting Fast or Slow Unloading Whether the Truck is Standing or Moving along a Roadway

DUMP BOTTOM FOR TRUCKS SAVES TIME AND LABOR

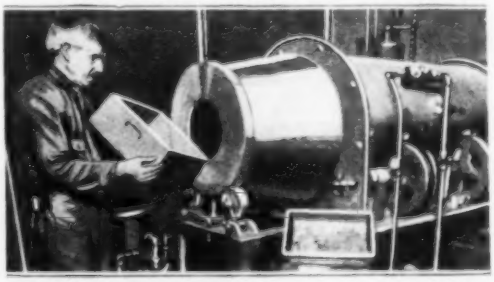
A labor-saving improvement in truck bodies, designed to be applied to any type of motor truck used in hauling materials for road building, and the like, consists of a series of plates forming a bottom that can be dumped by operating a single lever. These plates, or leaves, extend the width of the truck body and, when the bottom is closed, make a tight floor. Each is pivoted off center, and its axle is connected by a lever with a bar extending along the side of the body to an operating lever beside the driver's seat. By shifting this lever the load can be discharged slowly or quickly and distributed along the roadway at the same time. Thus the labor ordinarily required to spread the material is saved.

VACUUM WASHING MACHINE FOR ARMY BLANKETS

As any laundress will testify, washing woolen blankets is hard on the hands, the back, and the blankets. In the British army, the multiplied problem led to the design of a blanket-washing machine. The blankets are placed in a circular galvanized tank with the prepared washing fluid. A vertical spindle carries three vacuum cups which alternately pound the blankets and draw water through them by suction as the spindle rises and falls, driven by an eccentric. A slight rotary motion changes the position of the spindle at each stroke, and a spring gives extra pressure to insure a good vacuum. One machine washes 600 blankets in 10 hours.

FURNACE ANNEALS SHELLS IN VAST NUMBERS

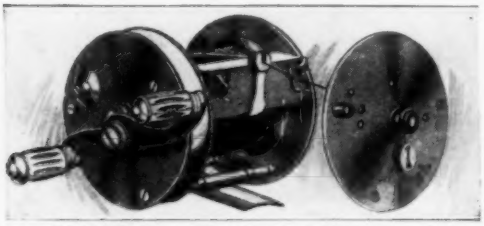
One of the machines which helped make possible the enormous output of ammunition required by our forces during the war, is an automatic annealing furnace which, it is said, is capable of annealing 250,000 cartridges in 10 hours. The time required for the passage of shells from the hopper to the dumping spout varies from six to nine minutes, according to their thickness. The furnace is heated by gas, and its temperature is regulated by a pyrometer.



Feeding Cartridge Shells into a Furnace Which Automatically Anneals Them at the Rate of 25,000 an Hour: The Process Consumes from Six to Nine Minutes

THREE DESIRABLE FEATURES COMBINED IN NEW REEL

An improved reel for fishermen combines the level-winding, free-spool, and antibacklash features in a single article.



This Fishline Reel Has a Level-Winding Attachment, Which Is Inoperative When Casting, and Also Automatically Provides against Backlash

The level-winding device operates only when reeling in the line and falls out of the way when casting. The spool gears are always in mesh and a clutch is provided, which automatically takes hold when winding up the line but lets go when paying it out. The instant the bait strikes the water, the antibacklash mechanism within the reel automatically thumbs the spool. Any tension desired can be secured by adjustment.

¶ Reducing the resistance of negative arc-light carbons by an admixture of 30 to 50 per cent of graphite is found by European investigators to produce a stable arc with high current density at the electrode surfaces. This results in reducing the shadow thrown by the negative electrode.

GERMANS WATCHED FROM AIR BY YANK OBSERVERS

America's army of occupation in the Rhineland is expecting no attack by Hun forces, neither is it resting its arms and forgetting the habits of the enemy. In brief, sausage balloons, with military observers maintaining vigil, float high above the Yankee lines as in the days of active warfare. The first of the balloons was sent up early in the year from the fort of Ehrenbreitstein in the bridgehead zone, near Coblenz.

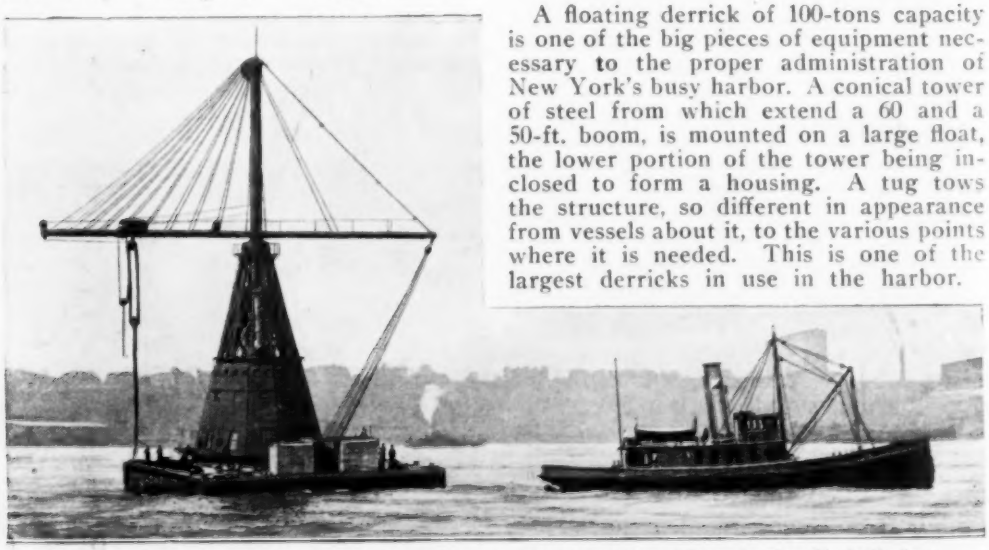
SURGEON'S SCREW STAND USED IN PLATING BONES

An English surgeon found that in plating bones much time was wasted in trying properly to size each screw preparatory to inserting it in the bone. To remedy the difficulty he devised a circular tilted stand, having shallow holes in its face, in which the screws are set so that they can be easily grasped with a screw holder. The device, with screws in place, is lifted from the sterilizer direct to the instrument table without trouble or loss of time.

BY COURTESY OF THE LANCET, LONDON

POWERFUL FLOATING DERRICK IN NEW YORK HARBOR

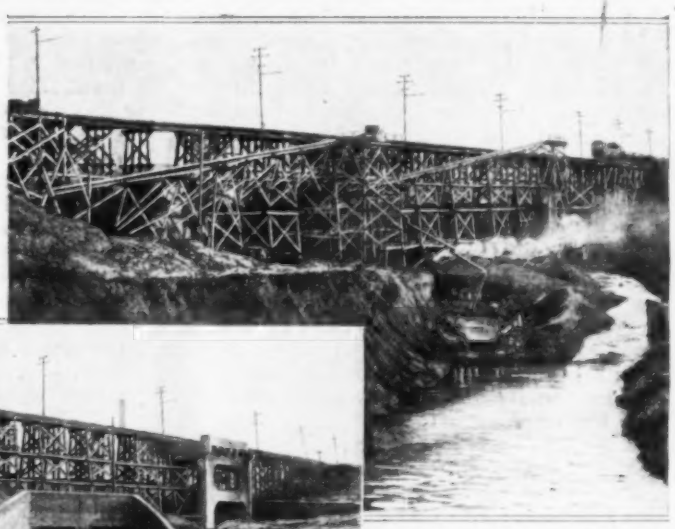
A floating derrick of 100-tons capacity is one of the big pieces of equipment necessary to the proper administration of New York's busy harbor. A conical tower of steel from which extend a 60 and a 50-ft. boom, is mounted on a large float, the lower portion of the tower being inclosed to form a housing. A tug tows the structure, so different in appearance from vessels about it, to the various points where it is needed. This is one of the largest derricks in use in the harbor.



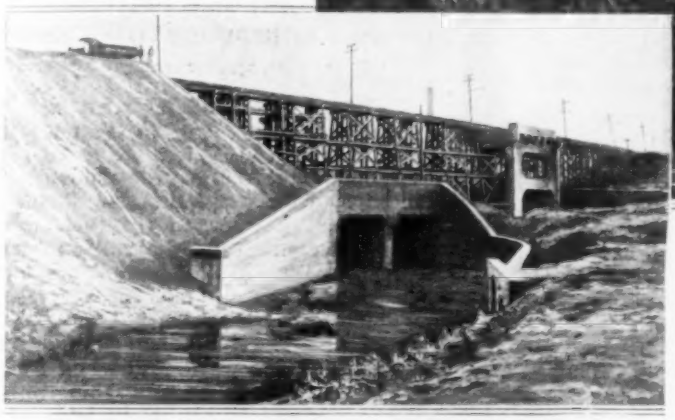
Floating Derrick of 100-Tons Capacity Used around the Docks and Piers in New York Harbor: One Boom Is 60 and the Other 50 Feet Long

RIVER TRESTLE FILLED IN TO EASE PASSENGERS

It is human nature to feel a sense of apprehension while passing over a high trestle, little wider than the track, in a railway coach. The feeling is perhaps aggravated by the smaller size of the interurban electric car. It is not generally supposed that railroad officials recognize this failing, which is practically never the subject of public complaint. An electric interurban road, running out of Milwaukee, Wis., however, is spending about $150,000 to eliminate that very source of discomfort. The crossing of the Kinnickinnick River, approaching Milwaukee, was accomplished over a high trestle 1,000 ft. long. This trestle has now been filled in with earth, so that the tracks, to all intents and purposes, run on a much more substantial-looking ridge of ground. The filling-in process required the use of 100,000 cu. yd. of earth before the trestle entirely disappeared from view. Over the river itself it was necessary to build a huge concrete culvert, through which the Kinnickinnick now flows like a mammoth drain. The culvert is 197 ft. long, 48 ft. wide, and 20 ft. high, and is reinforced by a central partition. Abutments extend for a short distance from the culvert along the river banks, to prevent slippage of earth from the embankment into the bed of the stream. The original trestle was not disturbed, except at the point where the concrete culvert was formed, and its great spidery structure remains to give additional solidity to the new earthen track base in which it is buried. Service over the railroad was not interrupted by the work of filling in, and the passengers now make the crossing at ease, almost unconscious that they have crossed a river and totally unaware of the trestle.



This Is the Way the 1,000-Foot Trestle Looked Before It was Filled with Earth



The Long Trestle is Shown Here with the Fill Partly Completed and the Kinnickinnick River Flowing through the Finished Concrete Culvert. The Completed Fill will Give the Railroad a Solid Earth Foundation

IMPROVED FITTING STOOL FOR SHOE STORE

An improved type of stool for use by clerks when trying shoes on customers is provided with an adjustable rule attached to the foot rest, so that the size of shoe desired can be quickly ascertained by measuring the customer's foot. With the rule permanently attached in this way, there is no possibility of its being mislaid.

¶Steps have been taken to establish a military cemetery in France designated as "The American Field of Honor."

SURGERY'S TRIUMPHS OVER DEATH IN WORLD WAR

By LEWIS T. JESTER

MARVELOUS surgical operations, some of which bid fair to revolutionize surgery, are described by Capt. H. H. Pillinger, United States Army Medical Corps. Captain Pillinger is a native of Chicago and was one of the first 30 American physicians to go to France. He was first assigned to the British forces and later was associated with the great French surgeon Duval. When the American forces reached the front he was detached from the British army and sent to study chest cases under Duval.

These cases, that is, wounds of the heart, lungs, or other vital parts of the chest, had been regarded as hopeless by the British, according to Captain Pillinger. The British were "shy on" medical men, and in the early part of the war took the stand that to treat a man wounded in the heart or lungs was practically risking the life of some less seriously wounded man, one with a better chance for recovery.

For this reason many of the British Tommies who were wounded in the chest at that time—that is to say, seriously wounded—were left to the last on the field of battle. The British army surgeons had all they could do to attend to the more hopeful cases.

"When the American forces began to reach the front in numbers," Captain Pillinger said, "I was called back from the British army and sent up to Doctor Duval to make a thorough study of chest cases. The American army had an ample number of surgeons and physicians, and the authorities wanted to give every man a chance for his life. Doctor Duval had been doing great work among the wounded French, and at that time was, and still is, I believe, the greatest surgeon in the world on what we term chest cases."

Captain Pillinger worked under Duval for some time and was then ordered back to the American front. "While with Duval, he told me and showed me all he knew," he states. "I rejoined the Americans. A few days later an orderly came in while I was operating and told me that there was a man in the next room wounded in the heart. I went in to look at him. The bleeding had all but ceased. He was placed under the X-ray. The picture led me to believe that the ball had lodged in the outer covering of the heart.

"I made an opening in the chest and felt for the bullet. My probing loosened the blood clot, and the blood shot several feet in the air. My glasses were covered with it. I removed them and stopped the flow of blood with my finger. Next, I closed the wound in the heart by bringing pressure against it with several clips, a kind of forceps, which were handy.

"Then I felt for the bullet with a probe. Hearing it click against the lead, I inserted a spoonlike forceps in the opening, and by loosening the clamps, drew the bullet out through the opening. I then readjusted the clips, cleansed the wound, and left the patient. I did not expect him to live, nor did any of my associates.

"The next morning I went through the ward, and when I got to the man, he was asking to be allowed to sit up in bed. He later completely recovered and was apparently a perfectly well and strong man when I last saw him. I would consider him a complete recovery."

Captain Pillinger also told of making an opening in a man's chest and lifting out the lungs so that part of them could be cut away. This grew to be a comparatively simple operation, he said, although, of course, great care had to be taken to see that the lungs were perfectly air-tight at its completion. He believes that this operation offers a cure for tuberculosis, at least in its earlier stages. The infected part of the lung may be cut away or otherwise treated. Whether it can also be used as a means of treating the lungs with sunlight or certain light rays, remains to be seen.

MINIATURE EIFFEL TOWER MADE WITH SCROLL SAW

A PIECE of scrollwork evidencing unusual skill and the expenditure of enormous time and patience is the miniature Eiffel tower shown herewith, which serves as a case for a clock. It stands 42 in. high and has a 22-in. base. No less than 82 pieces of wood, from which 3,500 parts have been sawed, compose the tower. Its construction occupied an average of five hours a day for 13 months.

Both of these operations are outgrowths of the war and were almost unheard of before.

The use of the magnet as a means of removing bits of shell from the brain, prevalent in the earlier part of the war, was later discarded. It developed, Captain Pillinger stated, that the magnet drew the bit of shell directly to it, often destroying perfectly good brain cells. Only when the bit of shell had penetrated the brain in a perfectly straight course, could the magnet be used with safety.

"We gave up the magnet, however, and probed for the bit of shell with our fingers or some instrument. When we got hold of it, we pulled it out. The torn or injured brain cells were then cut out and the parts treated with a saline solution. Sometimes the patient would lie for days, apparently seeing nothing and hearing nothing. Then you would go in to him one morning and he would speak to you. Yes, some of the brain cells were destroyed, and the patient sometimes lost the sight of one or both eyes. Yet, some of the cells later would be replaced by nature.

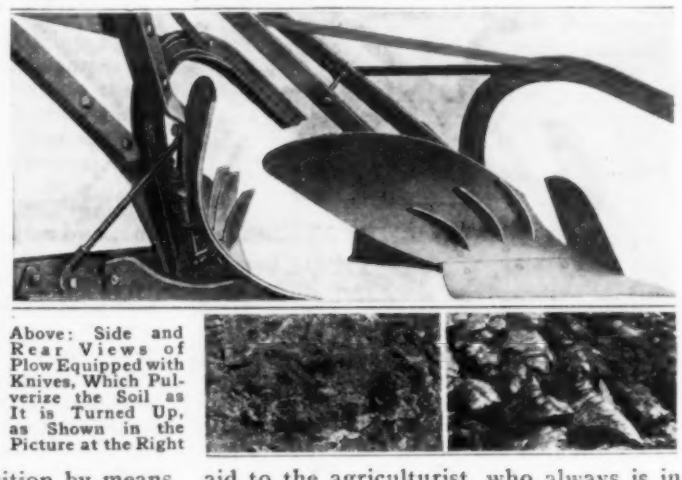
"I was with the British, the French, and the American armies for 18 months. During that time the old theories of cleanliness and germs were all but annihilated. Of course, it is better to have thoroughly cleansed and antiseptic materials with which to work. But I have used the same water in as many as six or eight operations, filtering it or otherwise treating it after each one. I have operated with the dust so thick that you could hardly see. I have had patients recover whose wounds had been infected in the worst kind of way for days.

"And before I was ordered home I was beginning to wonder how a man could commit suicide. I have seen men wounded in all kinds of places with all kinds of weapons. I had a British sergeant walk into my operating station. He had a bullet through his head. It had gone entirely through the brain. Yet he recovered.

"When the surgeons could get hold of the men immediately after they were wounded, the chances for recovery were much better. There was one boy, a British lad, who had both arms and both legs blown off. He was loading shells in an airplane and dropped one of them. The bits of shell flew outward instead of upward. He was stooping over, and they took his arms and legs off. He was brought in at once, We stopped the flow of blood. Later I asked him if he wanted to live. He said: 'Yes, doctor, life is sweet, even like this.'"

PULVERIZING ATTACHMENT FOR PLOWS

An attachment for a plow has recently been invented which breaks up the soil as it is turned back in making a furrow. The extra power required to pull the plow so equipped is said to be surprisingly small, and the necessity of going over the ground with a pulverizer is entirely done away with. The new feature consists of three curved knives projecting through slots in the moldboard of the plow at such an angle that they slice the soil as it is turned back. The knives are pivoted to suitable supports on the back side of the moldboard, and are held in the proper position by means of coil springs, so connected to them that pressure against the cutting edges puts the springs under compression. This arrangement gives the knives enough play to prevent their being clogged with roots and stones. To all appearances the invention is one that may prove to be of material aid to the agriculturist, who always is in need of new devices that will save time and labor.



Above: Side and Rear Views of Plow Equipped with Knives, Which Pulverize the Soil as It is Turned Up, as Shown in the Picture at the Right

WAR-TIME AUXILIARY FIREMEN RENDER VALUABLE AID

Among the organizations which have rendered valuable service in the cause of public safety during the time that the nation's man power at home has been depleted, is the auxiliary corps of the New York fire department. These men responded to an urgent appeal for helpers to take the place of more than 500 firemen who were called to the colors. They were on duty from 8 p. m. until 6 a. m., sleeping in quarters provided by the department. Until they volunteered the remaining members of the regular force were sorely overworked. These helpers responded to second and third fire alarms and assisted at fires by stretching lines, picking up hose, and doing much other work.

Members of Auxiliary Corps of the New York Fire Department, in Their Fire-Fighting Outfits: These Men Are Volunteers Who were on Duty Nights Doing the Work of Firemen Who were Called to the Colors

DRIED BEANS AND APPLES LAUNDRY BY-PRODUCT

Vegetables and fruits are as easily dried as clothing by the evaporative processes of the modern laundry. The produce, mostly corn, beans, and apples, is brought to the laundry already prepared and placed on large trays in the drier. Steam is kept up for a while in the evening, and the trays are removed in the morning. Each tray holds about 10 lb., and the drier can handle 150 lb. at a time.

CARBON-BLACK PLANTS MOVE TO CONSERVE GAS

Because of the waste of natural gas in the production of carbon black, manufacturers of that commodity agreed to close their plants in the vicinity of Grantsville, W. Va., and hereafter to use gas wells in either Wyoming or Louisiana whose locations are too remote for community use. Carbon black is simply the soot deposited on metal plates in contact with an open gas flame. In the process the heat is all wasted, and but a small portion of the carbon recovered. Only 1⅛ to 1½ lb. of carbon black results from the burning of 1,000 cu. ft. of gas. The agreement was calculated to save 15,000,000 cu. ft. a day, which at once became available for domestic and public-utility use. A by-product of the gas, formerly wasted, is 5,000 gal. of gasoline a day, arrangements for the recovery of which were made. About 10 per cent of this country's population is in natural-gas territory.

PLUG PROTECTS MOTORS AGAINST OVERLOAD

A special feature of a switch designed for connecting alternating-current motors direct on the line is a protective plug located immediately below the switch proper. The motor circuit is completed through a heating coil, post, a link, and a spring contact arm. In case of an overload, the current will heat the post enough to melt the link, which is made of fusible alloy. This allows the contact arm to spring back, breaking the circuit. Because of the lag, the momentary inrush of starting current will not open the circuit unless there is a dangerous overvoltage on the line.

In This Service Flag There Are 31,200 Stars, of Which 1,002 Are Gold. It Is Ohio's Largest Service Flag and Represents the Boys from the Cincinnati Area of the Methodist Church

BIGGEST OHIO SERVICE FLAG FOR METHODIST BOYS

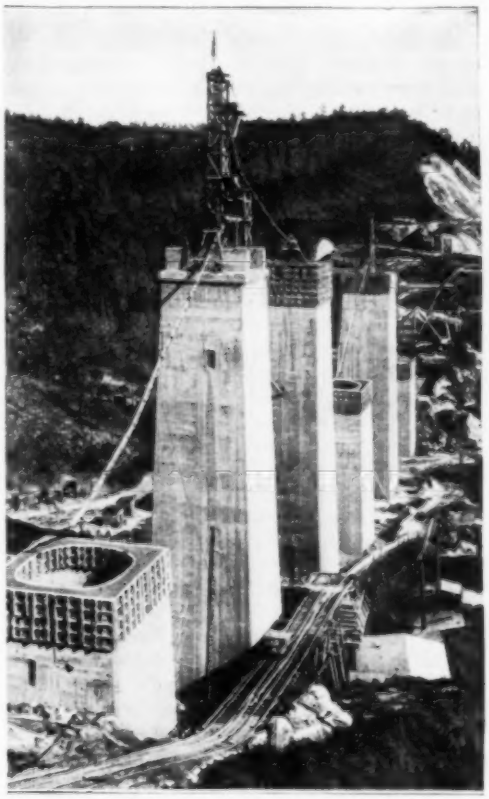
A service flag carrying 31,200 stars, unfurled in Memorial Hall, Columbus, Ohio, represents the boys from the Cincinnati area of the Methodist Church who went into service. Those who will not return are accounted for by gold stars to the number of 1,002. The flag, one yard wide, is 200 yd. long, and took the work of 320 women to make. It was carried to the hall by 50 Columbus soldiers and chaplains, and is the largest service flag ever displayed in Ohio.

WIRELESS SERVICE FOR MAIL AND PASSENGER PLANES

A radio company is now prepared to provide aeroplanes used in mail and passenger service with wireless outfits and operators in the same manner that it now supplies them to ships. Planes so equipped will each have a distinctive name, or number, so that it will be possible to send messages to persons in flight in the same way that communication is now maintained with vessels at sea.

CONCRETE PIERS FOR HIGH BRIDGE ARE HOLLOW

An unusual engineering feat in connection with double-tracking portions of the Southern Railway, is the construction of eight immense concrete piers to carry a 1,400-ft. bridge across a ravine near Toccoa, Ga. The structure is nearly 200 ft. high, and the piers are 30 by 34 ft. at the top. Because of their size, they have been made hollow, being the first piers of this



Hollow Piers for a Railway Bridge Nearly 200 Feet High, Not Far from Toccoa, Georgia: This is Said to be the First Time Construction of This Type has been Used for Piers of Such Height

type for a bridge of such height, it is said.

NEW HIGHWAYS OF TODAY AND

By HARLAN

In Making Automobile Drives, "Rubber Stone" is Laid on Loose to a Thickness of Five Inches

ONE hundred and ten millions of dollars to be spent on permanent roads in five years—such is the allotment made by the states of Illinois and Pennsylvania in the recent elections, with similar sums likely to be voted soon by many of their sister states. Sixty millions was Illinois' share, to be paid entirely by automobile and motor-truck owners during the next 20 years without resorting to general taxation.

This is just one indication of the great interest in good roads aroused by the transportation needs during the great war just past. People are now awakening to the fact that the best investment they can make is in the construction of good roads, permanent roads, and roads wide enough to permit two automobiles or trucks to pass in safety.

Along with this tremendous increase in popularity of good roads has come the development of new and better types of pavement, each singularly adapted to the varying needs of heavy and light city and country traffic. There have come greatly improved methods of building our present types of road—the earth road, the tar or asphalt roads, the wood-block, stone, concrete, and brick roads, and with them, carefully compiled records of the costs. With this information, after making careful studies of the peculiarities of the locality, the water and material supplies, density of traffic, etc., the road engineer can prescribe the type and kind of pavement best suited to the present and future needs of any locality, as well as its probable cost.

The Country Road Commissioner Piles Soft Dirt and Sod on the Road and Drags It to a High Crown Almost Impossible to Travel in Wet Weather, and Bad in Dry

The earth road, most common of all, has been also the one most abused, for it seems to be the delight of most country-road commissioners to drag the dirt and sod from the side ditches up into the center of the road, thus building up a high crown that no ordinary vehicle could travel in wet weather without sliding into the ditches. These high crowns are being reduced, for it has been proved that an earth road with a slight crown can be kept in good condition at a much less cost. If the travel warrants the cost, light asphaltic oil may be applied occasionally as a dust preventive and surface binder, but people are coming more to a realization that this is but a temporary aid, and must be renewed often. They are therefore in many localities capitalizing this cost, and through the issue of bonds payable in from 15 to 30 years, they are obtaining the immediate use of hard roads at no additional cost.

In our cities and towns, where permanence, cleanliness, noiselessness, ease of making openings in the pavement, and the cost are the ruling factors, the pavement varies and the selection of the proper type is usually governed by the density of traffic. Here great strides have been taken. For residence streets, and others having a medium amount of traffic, there has been developed, at Detroit, Mich., a new type of pavement particularly adapted for the use of automobiles. It is called "rubber stone," and is a crushed limestone varying in size from ½ in. down to dust, impregnated with deliquescent or moisture-collecting and retaining chemicals. It is placed loose on the road to a thickness of 5 in., and rolled to a smooth, compact surface—elastic, dustless, noiseless, and weedless, and easy to take up and replace when it is necessary to get at pipes or wires beneath the pavement. When loose, it has the appearance of wet limestone

AND BYWAYS OF TOMORROW

H. EDWARDS

screenings, and when compacted, its smooth, damp surface takes up moisture from the rain, dew, air, and the soil beneath the road. Automobile tires, instead of acting as destructive mediums, sucking up the fine binding material for the wind to blow away, serve as constructive agents, packing down and ironing out the road surface. If a depression develops, it is only necessary to loosen the surface with a pick, throw in enough new material to provide a level surface, and tamp or roll it back into place. It is, in short, an excellent surfacing for medium traffic and residence streets, and for cemeteries, large estates, etc., where quietness and ease of maintenance as well as moderate cost are required.

For through streets, subjected to heavy traffic, the semimonolithic type of brick pavement has been evolved and will soon become the standard pavement for city use. It consists essentially of a 3 to 6-in. concrete base, or foundation, having placed upon it 1½ in. of a mixture of sand and cement, in proportion of one part of cement to from three to eight of sand. This mixture is cut to the proper crown with a curved template, and upon this surface the brick are laid and rolled, then flushed with water to provide moisture for the setting of the cement. The interstices, or joints, between the bricks are then filled with cement grout—a liquid mixture of about equal parts of sand and cement, providing a rigid, continuous, smooth, and lasting surface. The use of this sand-cement layer has been adopted to eliminate the many faults of the old sand cushion. This, during time of construction, often worked up between the brick and kept the cement filler from penetrating the full depth of the brick. The result is shown on page 564. Also, through vibration of traffic, moisture, etc., this layer of sand often compacted and shifted, causing the brick slab to rumble loudly as steel-tired vehicles traveled over it, and to break down in spots, producing loose brick, bumps, and finally ruts. The semimonolithic brick pavement is the natural evolution of the brick pavement for city use and will be adopted as standard by every progressive municipality.

The granite-block pavement, used for years on streets subjected to heavy trucking, is also represented in the new methods of construction. In a number of eastern and middle-western cities, "durax," a type of the granite-block pavement new to most localities, is gaining favor, especially for use along and between car tracks and on heavy-traffic business streets. The method of construction does not differ essentially from that of the semimonolithic brick pavement, but the shape and manner of laying the stone blocks is entirely different from any other type. The durax block is a cube of granite approximately 3½ in. on a side. In laying, the blocks are placed in crescent-shaped rows, —the purpose being to make all the joints at an angle to the direction of traffic, to reduce vibration, noise, and wear to a minimum, and to lock the blocks so that they are not easily loosened or pulled out by traffic. The sheet asphalt, asphaltic-concrete, and creosoted-block pavements have retained their popularity in most cities for use on streets subjected to heavy traffic where noiselessness is essential.

The Roughly Laid "Rubber Stone" is Struck Off to a Smooth, Regular Surface with a Wooden Template

In new construction for main and connecting roads outside the city, the types of pavement used have narrowed down to three—brick, concrete, and bituminous materials. The brick pavement, though in sharp competition with concrete, still maintains its supremacy among hard surfacings, for automobilists are beginning to complain of the strain on the eyes caused by the chalky whiteness of the concrete surface. The paving block, in former years of varying quality, is now subjected to severe tests, standard throughout the country, before being approved for use, thus assuring a uniformly tough wearing surface. The recent introduction of the monolithic type of brick pavement has caused a revolution in brick-road construction, and the old sand-cushion type has been relegated to the scrap pile.

The use of brick, or any other high-class pavement, however, is limited to localities sufficiently near centers of produc-

tion so that freight rates do not exceed the advantage in wear and appearance of the pavement.

In the construction of the monolithic brick pavement a very interesting procedure is followed. The concrete foundation is laid to a depth of from 3 to 6 in. on the rolled-earth subgrade, and the surface is struck off with a steel or wooden template to the required crown. Immediately, before this has had time to become at all hard or set up, the brick are laid by hand and rolled to a smooth, regular surface by a hand or power roller. The interstices, or joints, between the bricks are then filled with cement grout, a mixture of approximately equal parts of cement and sand, wet to the consistency of ordinary paint. All these operations are carried on successively, so that the completed road will be a concrete slab with a brick wearing surface.

Laying a Semimonolithic Brick Surface on a Concrete Foundation—a Good Pavement When the Brick-Producing Center Is Near, Avoiding High Freight Charges

In the Old Sand-Cushion Pavement, Above, the Cement Grout did Not Always Penetrate the Full Depth of the Brick, and Many Faults Developed, among Others That Shown Below

Here the Heat Expansion of Summer, Bearing Unequally on Protected and Unprotected Sides, has Shattered the Brick

Although this pavement is new, machinery has been developed almost overnight for its construction. A new power-driven steel template has been produced, which, using the side forms of the road as a track, cuts off the concrete base to the required crown and tamps it to a dense, solid consistency by means of several steel rockers, producing a thin film of mortar upon which to lay and grout the brick. By the use of this machine, the concrete base can be made with less water, so that a stronger pavement results. Several machines are now being developed to lay the brick upon this surface, and thus, by dispensing with four or six laborers now necessary to carry and lay the brick, the cost of the pavement can be cut down considerably.

This type of pavement has made possible the development of many new, money-saving ideas, so that old pavements can be made into new ones at a small cost. In a certain instance of this kind, a badly worn, rough brick road has been resurfaced with new, modern paving blocks at a cost of about $1.50 per square yard. The process was simple. After sweeping off the old pavement, a smoothing layer of concrete, made with fine roofing gravel, was placed on the rough brick and cut off by a wooden template to a smooth, even surface. New paving blocks were then laid, rolled, and grouted upon this surface, and a new, strong, and permanent road was the result.

In Champaign, Ill., the more economical idea of turning over and using the old brick has been quite successful. The old pavement was laid on a 2-in. sand cushion, with the joints between the brick filled with sand. The brick were taken up and the sand removed. Upon the old concrete base was laid the smoothing layer of fine gravel concrete, and the original brick, after being cleaned with wire brushes, were replaced, top side down, before the concrete had set. The brick were rolled and grouted in the usual way and allowed 15 days to set before opening the road to traffic. An excellent new surface was thus obtained at a cost of about 80 cents per square yard. There are many cities that could easily profit by these examples.

The cement road has been a favorite in

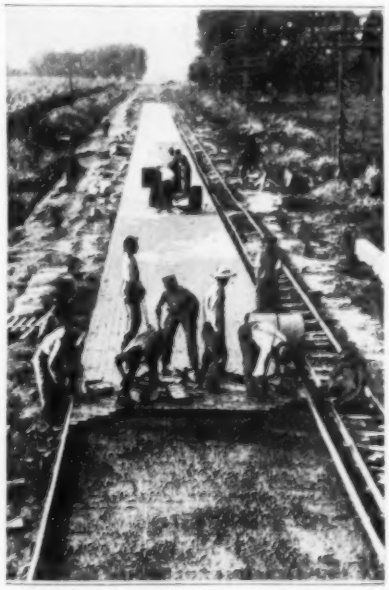
many localities on account of its simplicity and ease of construction as well as for its permanence. Many improvements have been made in its construction, all tending toward the production of denser, and, consequently, stronger and tougher concrete. At the same time the cost has been reduced somewhat by the elimination of the expansion joints, for it has been found by the Illinois State Highway Department that cracks in the concrete could not be entirely prevented by expansion joints; that it was cheaper and better to leave them out, let the cracks come where they would, and then to fill these with tar. Many schemes have been introduced for finishing the surface, the most useful recently adopted being the use of a light, wide roller on the fresh concrete, to squeeze out the excess water and compact the concrete, finishing up with a long, light canvas belt dragged back and forth across the surface. This produces a dense, even, smooth concrete, just rough enough to prevent slipping in wet weather.

The bituminous-macadam roads are great favorites also in many parts of the country. Many of our more populous states have devoted much time and money to the construction of this type, especially for use where motor traffic is heavy. Adequate methods of maintenance are required, however; or it becomes rutty, rough, and a menace to travel.

Stone Paving with the Granite Blocks Laid in Curves Instead of Straight Lines Wears Much Longer Because Wheels and Hoofs Strike All Sides, and Corners and Edges are Not So Quickly Nicked Off

Together with the development of all these different kinds of roads has gone the introduction of methods of maintenance and repair. Formerly it was the custom to build a high-priced road, then leave it without attempt to remedy slight imperfections until the surface had become practically ruined. The old adage, "A stitch in time saves nine," is nowhere more true than in road maintenance; hence many states now have adopted or are adopting the patrol system of maintenance, whereby the roads

This Monolithic Brick Pavement Is in a Very Raw State, Materials for It having Just been Dumped



Here It is Nearly Finished. The Men in Front are Laying the Brick, and the Others are Filling the Spaces

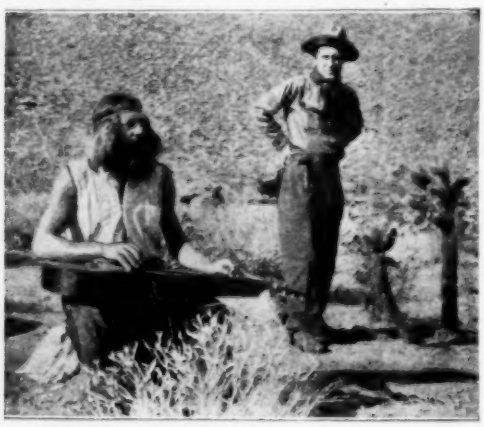
are kept in perfect condition by the continuous watchfulness of men trained in their repair.

With the adoption of these most efficient methods of construction and maintenance for all the roads soon to be built by the various states, and also for those built by the large Federal appropriation for interstate roads under the Federal Aid Act, our roads of tomorrow should be of maximum value to everyone. They will be built much wider and stronger than many we have now, and of the most durable materials, for they will have to bear a greatly increased motor-truck traffic if the growth in use of such trucks in the past few years is any criterion. They will reach out into every part of our land, uniting the country with the cities, making communication among all the people easy and convenient, inducing social intercourse, and thereby making of the whole population one great family.

The Equipment for Surfacing Work, as Seen Above, Is Simple and Produces at Small Cost a Smooth, Permanent Pavement Like That at the Right

MAKE NEW CAVE IN YOSEMITE FOR HERMIT'S HOME

About a hermit there always hovers an air of romance and mystery. Recognizing this feature as an attraction to the curious tourist, a wealthy hotel owner of Yosemite Valley prepared a commodious cave by blasting into the granite walls of the cañon, and set therein a transplanted hermit. The recluse in question had long been the sole inhabitant of a natural, but less pretentious, cavern in a hill of hardened lava in the Imperial Desert, near Palm Springs, Calif. Here his pet rattlesnakes, tarantulas, horned toads, and desert lizards, to say nothing of a steel guitar upon which he performed, had proved entertaining enough to draw auto tourists over 160 miles of road into the hot alkali sands. The transplanted hermit is now much more accessible.

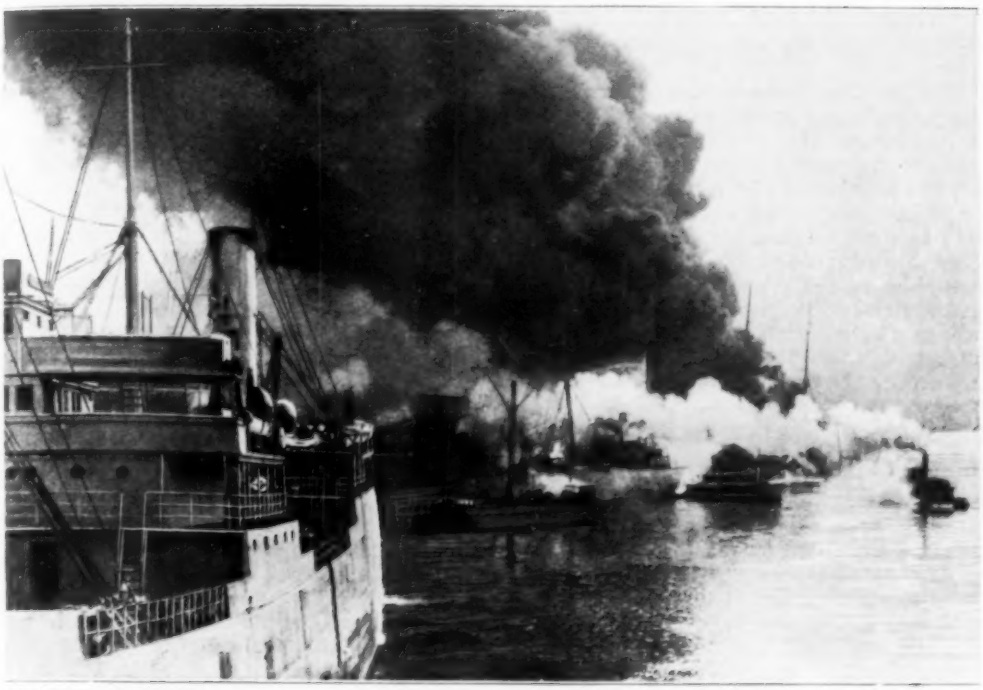


This Hermit of the Imperial Desert, with His Steel Guitar and His Reptilian Pets, has been Transplanted to a Brand-New Cave in the Yosemite

AEROPLANES TO CARRY RADIO OUTFITS TO INLAND CHINA

Typical of the manner in which modern inventions are bringing widely separated sections of the world in closer touch with one another is the fact that wireless stations are to be erected in remote parts of China. One of these is to be near the Kashmir border and another near the Siberian boundary. Equally interesting is the announcement that the apparatus for these stations is to be carried to its destinations in one or more large aeroplanes which expect to make the journey in two or three days instead of the same number of months.

¶By presenting its annual report by means of moving pictures, the directors of the Louisville Industrial Foundation have set a precedent that is unique in the annals of the business world. They considered it the best way of bringing visible evidence of their progress before their stockholders' eyes.



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Two Oil Steamers and a Barge were Destroyed in the Schuylkill River, near Philadelphia, When a Burning Tanker Spread Its Blaze over the Water

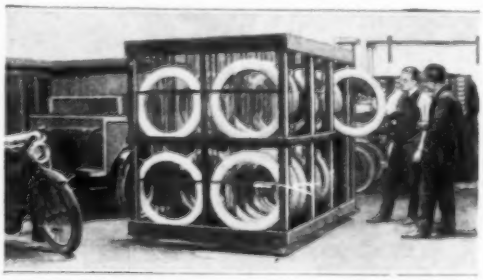
BURNING OIL-TANK STEAMER SETS RIVER ABLAZE

A river of blazing oil; the dull, booming reverberations of exploding iron oil barrels; jets of fire spouting from ignited pipe lines, and over all, the rolling black clouds that obscured the hulls of sinking ships—these were the spectacular features of a fire that destroyed two tank steamers and a barge at Point Breeze, south of Philadelphia. The fire started in the hold of an oil tanker lying in the Schuylkill River. In a few minutes the ship was doomed, and the fire spread to the others. Flame-pursued, seamen leaped into the blazing river while flying oil and sections of hot iron forced the fire fighters back and threatened the big refining plant on shore. Only heroism of battle-field quality saved the adjacent ships and property.

¶ During the past winter men were detailed by the Fisheries Bureau to cut holes in the ice formed over sloughs and ponds along the upper Mississippi River to prevent the repetition of what occurred the previous winter, when thousands of fish caught in these landlocked waters are said to have died from lack of oxygen.

TIRE RACK ON CASTERS FOR SMALL DEALERS

Tires hung from the ceiling, out of reach of customers, are not conducive to sales. A Los Angeles motorcycle dealer who observed that fact, but whose wall space was inadequate for a fixed rack, built himself a rack on casters, which serves his purpose well. It carries a small but sufficient stock, within easy reach and examination of the customer, and is easily rolled to any part of the floor. That feature also solves the usually embarrassing problem of sweeping and cleaning under the tire rack.



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This Tire Rack is Mounted on Casters, and So may be Put Anywhere in the Shop or Brought to a Customer

DUAL-SIGNAL MECHANISMS CONTROL TRAFFIC

To provide adequate means for controlling the heavy traffic existing at certain street intersections in San Francisco, special mechanical equipment has been installed which gives both visual and audible signals. Suspended above the pavement at the foot of Market Street is a large sign bearing the words "Stop" and "Go," which is made to revolve by a motor-driven apparatus contained in a small case above the sign. A traffic officer on the street operates the signal by means of a control switch, and when the motor turns the sign, it also causes a whistle to blow one or two blasts, according to the direction traffic is to travel. In case an ambulance or fire apparatus demands the right of way, the throwing of a special switch causes the sign to revolve and the whistle to blow continuously.

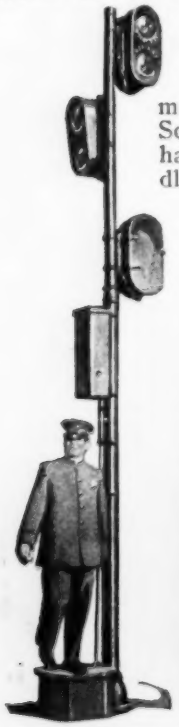
A somewhat different signal system, consisting of seven pairs of lights, red and green, is installed at the intersection of Market, Geary, and Kearney streets, and is operated by one officer by means of a foot lever. Here the direction in which traffic can move is indicated by red or green lights, supplemented by one or two blasts of a whistle operated automatically by motor-driven apparatus. Somewhat similar devices have proved helpful in handling traffic in other cities.

SUBSOIL MOISTURE IS CITED AS DROUGHT PROTECTION

Because of the long drought suffered in different parts of France last year, considerable interest was recently manifested in a report of scientific research read before the Academy of Sciences. Stress was placed upon the importance of the water present in the subsoil and the effectiveness of manure in preserving it. Use of the latter provides young plants with the moisture necessary for sturdy root development, which in turn defends them against seasonal droughts. It was disclosed that the normal quantity of water held in the soil to a depth of 1.64 ft. varies from 250 to about 390 tons per acre.

MODELS, TOYS, AND GAMES BOOST SHIPPING IDEA

Not battleships but merchant vessels are the approved mold for coming toys and the motif of new and exciting games for the youngsters. The project of encouraging youthful interest in the ship idea is so highly regarded that it has received official support and coöperation. Plans and blueprints used by the Emergency Fleet Corporation were gladly loaned to toymakers for study, and help extended in other ways. In games, merchant ships make competitive voyages and further encourage any latent seafaring tendency the coming generation may reveal, besides cultivating a map acquaintance with foreign ports.



The Signaling Apparatus at the Left, and That Shown in Use in the Other Picture, Illustrate Two Traffic-Regulating Devices in Successful Use at San Francisco Street Intersections

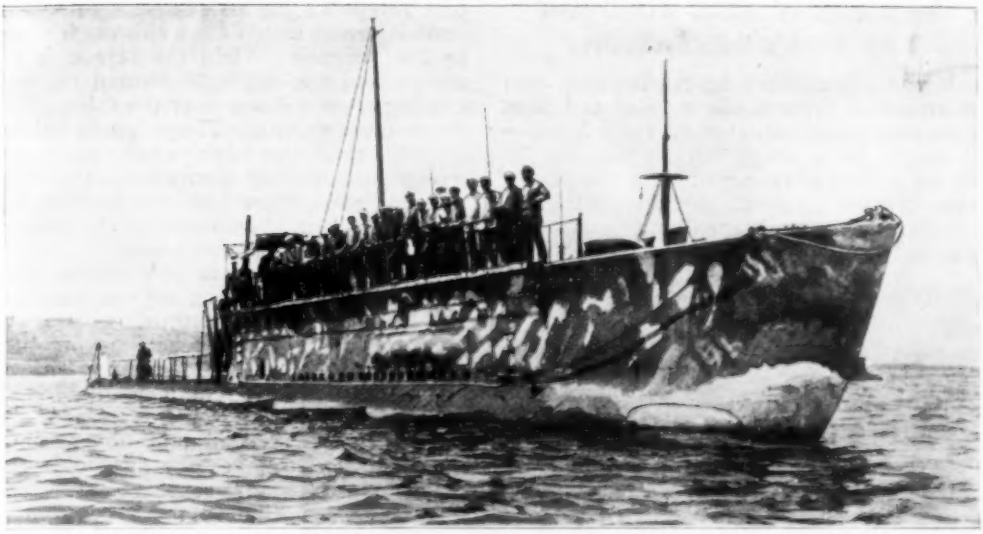


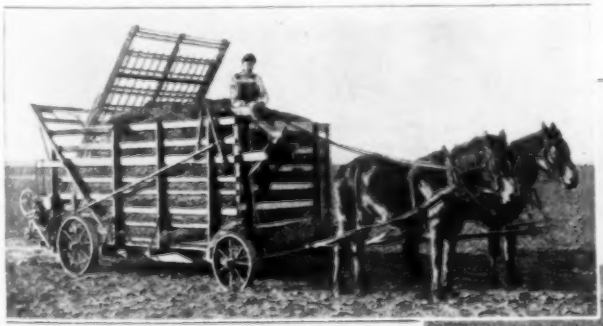
PHOTO BY CENTRAL NEWS PHOTO SERVICE

FRENCH UNDERSEA CRAFT OF STRANGE TYPE

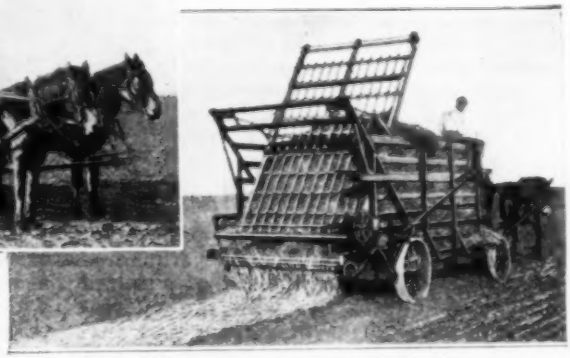
PRESENTED above is a photograph that shows a distinctively new type of submarine which is now in the service of the French navy. According to the information at hand, the vessel is considered the most powerful underwater craft so far evolved. It seems possible, however, in the absence of complete data, that the boat may be a submersible rather than a submarine—capable of sailing with deck awash, but not intended for deep diving. This suggestion, however, is mere conjecture.

FOUR-WHEEL STRAW SPREADER OPERATES AUTOMATICALLY

Of possible economic importance for certain agricultural districts is a one-man straw spreader of current development that is claimed to be the first successful four-wheeled apparatus of its type. It is built to handle a load of 1,600 or 2,000 lb. automatically, and is said to distribute an even layer of straw across a 9-ft. path. In general, the machine is much like a manure spreader, but it is intended only for the purpose of spreading straw. In operation, an endless-belt conveyor works on top of the load, raking the straw to a beater wheel. This is provided with guards that retain surplus straw and prevent uneven distribution. Underslung construction places the load low so that no material difficulty is encountered in using the machine in moderately windy weather. Likewise, the low center of gravity enables the spreader to be driven on side hills and uneven ground without danger of capsizing, even on a slope of considerable angle.



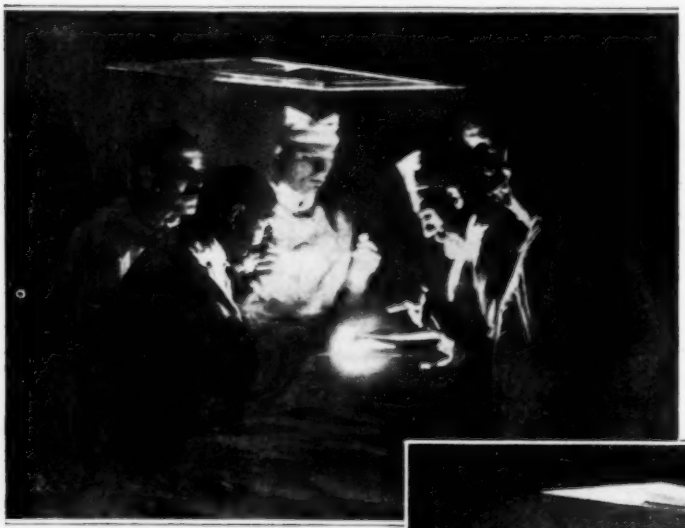
Automatic Operation, One-Man Control, and Full-Load Capacity Make the Apparatus Well Suited for the "Short-Handed" Farmer



Showing the Machine in Use: Straw is Taken from the Top of the Load and Distributed Evenly across a Path Nine Feet Wide

RED LIGHT AIDS SURGEON IN X-RAY OPERATION

Silent, white-robed figures bending over a prostrate form while a lurid red light glances from sharp steel in their hands—it might be a stage setting for the Inferno, or the ultra-ingenious ceremony of some mystic league. But the red glare, which flashes and goes out and then gleams again in a deliberate cycle, marks a wholly beneficent performance. It is aiding the marvelous but limited revelations of the X-ray to guide the hand of the surgeon in its delicate repairs on damaged humanity.



All Lights Are Out While the Surgeons Examine the X-Ray Shadows on the Fluorescent Screen above the Patient's Body

X-rays, penetrating human tissue, cast upon a luminous, fluorescent screen a silhouette, a shadow—nothing more. The surgeon, skilled in reading the significance of such shadows, gazes upon the screen and works in darkness, with his hands exposed to the baneful influences of the rays. The method did not satisfy a French surgeon. Conceiving the advantages to doctor and patient of adequate illumination, he experimented cautiously with a bright light of pure-red hue used alternately with the fluorescent screen. The arrangement was successful, and was put to splendid use in a French war hospital. With the X-ray tube below the operating table and the fluorescent screen above, an exposure of 30 seconds is found ample for a thorough study by the surgeon. Then the screen is removed and the red light turned on, emanating from a dome over the table. The dome carries twenty 25-cp. lamps behind a double thickness of pure ruby glass. An operation is quickly performed, and then the red light is turned off and another ray exposure taken, if necessary, to reveal the next step in the surgeon's work.

It is well known that the human eye, exposed to light of a primary color, reacts by creating an after-impression of the complementary color. For this reason, the red illumination actually makes the surgeon's eye more sensitive and receptive to the greenish-yellow rays from the fluoroscope. And similarly, the peculiar tint of the fluorescent light accommodates the eye to the red glow when the change is made.

Then the Red Lights in the Dome Overhead are Turned On, and Sharp Knives in Skillful Hands Work Out, in the Safety and Security of Adequate Illumination, the Knowledge Gained from the X-Rays in the Darkness

With this apparatus two brief X-ray exposures were necessary for removal of a piece of shrapnel in a soldier's heel, while a similar piece imbedded in the thigh required six flashes of the rays upon the fluoroscope, and six intervals of ruby illumination to guide the actual work of the knife.

CHANGE PROPOSED IN SYSTEM OF NAVAL CAMOUFLAGE

Toward the end of active warfare many methods of counteracting the optical effects of maritime camouflage became known to allied and, likely as not, to German naval authorities. Therefore one of the originators of the so-called "dazzle" system of protective painting is now active as its opponent and is advocating a return to a modification of the "great white fleet" idea. He would have all United States fighting ships painted white and gray, or white and pink. After conducting extensive experiments with models and small ships, he has found that a white boat with a light-gray superstructure possesses lower visibility than craft painted in any other manner. He also calls attention to the fact that under certain conditions a combination of white and pink blends with the background excellently and renders a ship invisible at a distance of about a mile. On the other hand, it is pointed out that a vessel of any color is highly visible when silhouetted against a brilliant horizon, or in the sunlight. Between these extremes, the white and gray boat is said to be of low visibility, and at a range of a mile or more is invisible.

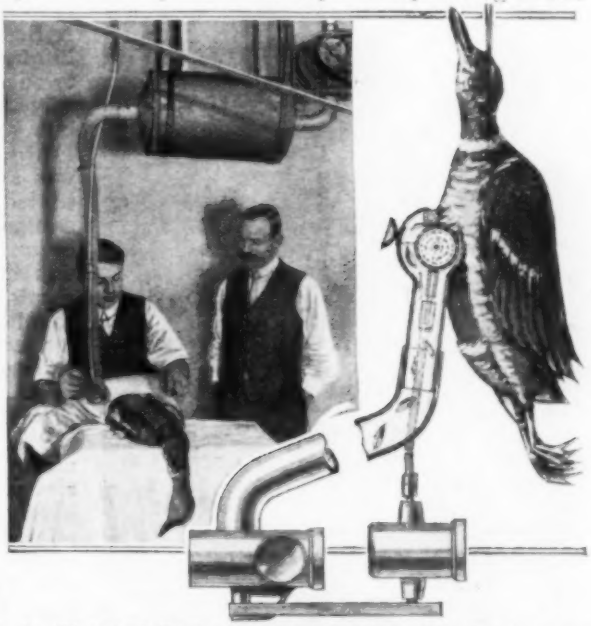
CULTIVATOR ATTACHMENT FOR GARDEN HOE

By clamping a two-tine attachment, recently devised, to the back of an ordinary hoe, the latter is equipped to serve as a hand cultivator. The two tines are mounted on a crossbar which is fastened to the hoe blade by means of thumbscrews. With the attachment one can save much time by cultivating both sides of a row of young plants at once.

¶ Nine-o'clock curfew in East St. Louis, Ill., is announced on the movie-show screens just before the whistle blows, so that unaccompanied children can hurry home.

FOWLS QUICKLY PLUCKED WITH VACUUM MACHINE

A machine of the vacuum type has recently been developed for plucking fowls,



An Electrical Feather-Picking Machine: The Feathers are Plucked from the Flesh by being Drawn between Rollers Driven by a Flexible Shaft, and Then into the Receptacle Overhead

with which, it is said, a person can remove all the feathers, dry, from an average-sized bird in about five minutes. A motor-driven fan creates suction in a large flexible tube, at the free end of which is a special plucking apparatus. This consists of a hood in which is a slotted roller, driven by a flexible cable and in contact with an idler roller of rubber. The rollers, as they revolve, pull the feathers from the flesh. Once loosed, the feathers pass through the tube into a large receptacle overhead.

INDIA BUILDS WOODEN SHIPS FOR MERCHANT MARINE

India, fired by ambitions to have a merchant marine of her own, is reviving her ancient industry of shipbuilding. Steel, of course, cannot readily be obtained, but already 44 wooden vessels are being constructed of timber supplied by the forest departments in Madras, Bombay, and Bengal. To encourage the shipbuilders, moderate rates and easy terms are made on timber contracts, and the ship's insurance policy is security for payment.

TROLLEY-WIRE TAP PERMITS CAR TRAFFIC WHEN IN USE

Portable apparatus has been built for use on San Francisco street-car lines for tapping a trolley wire in such a way that

Portable Trolley-Wire Tap Which Makes Contact in Such a Way That It does Not Interfere with the Passing of a Trolley Wheel

it is not necessary to remove the device each time a car passes. The saving of time in operating machinery driven by the current obtained is considerable. The device consists of a broad-based steel standard intended to be set the proper distance from a track and having an arm at the top extending to the trolley wire. At the outer end of the arm is a contact plate which fits about the underside of the wire so closely that it does not interfere with the passing of a trolley wheel. Ropes are provided for adjusting the arm to the proper height. Current is carried by cable from the contact plate to the motor supplying power for the machinery in use.

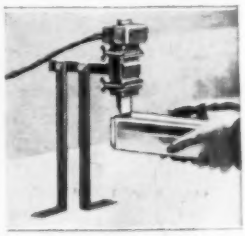
¶ Once again, after an absence of 48 years, French pilots are to be seen on boats that ply up and down the Rhine. Recruited from the French navy, the men will guide steamers and barges carrying supplies to the army of occupation, and gunboats patrolling the river.

PIGEONS BEAR "S O S" CALLS OF AIRMEN ADRIFT AT SEA

Much of the time the North Sea, because of its stormy disposition, is a most disagreeable alighting place for a seaplane. A Boston pilot, flying with two observers in quest of a German submarine, encountered engine trouble that necessitated a forced "landing" 35 miles north of Dunkirk during the period of active warfare. Fortunately for those aboard, the craft was not swamped by the waves when it settled to the surface, but there was no assurance that such a disaster might not occur at any moment after the sea anchor was thrown out. It was not possible to repair the motor, and even if the work could have been done, the condition of the sea would have prevented the machine from taking to the air. The only link between the seaplane and its base was a pair of homing pigeons. These, bearing messages, were released, one of them 30 minutes after the other. For three hours the airmen bobbed with the disabled machine. Finally a French trawler approached and offered assistance, which would have been accepted except for the sudden appearance of a British patrol which took the plane in tow. On the way back to Dunkirk, the boat that had been sent out in response to the pigeon-borne requests for help was met.

SOLDERING IRON FOR CANS HAS NOVEL FEATURES

Some unusual features of a soldering iron now used in the manufacture of tin cans developed out of the difficulties of a biscuit maker, whose container department could not keep up with the government's demands for hardbread deliveries. A manufacturer of electrical equipment devised an iron made of a piece of bar copper, 1 to 1½ in. wide, and ⅜ to ½ in. thick, held between two iron plates and bracketed to the workbench. On the sides of the copper are clamped two standard electrical-heating units, insulated with mica and covered by a steel jacket. The heating units work independently and are easily renewed. Using this new tool, 150 operators each averaged 1,000 cans a day.



JAPAN'S PEACE JUBILEE A MARVELOUS SPECTACLE

The Float of the Sun God Heading the Procession Held in Yokohama, Japan, in Celebration of the Signing of the Armistice: This Was But One Incident in a Two Days' Jubilee Such as the Island Empire has Seldom Seen Before

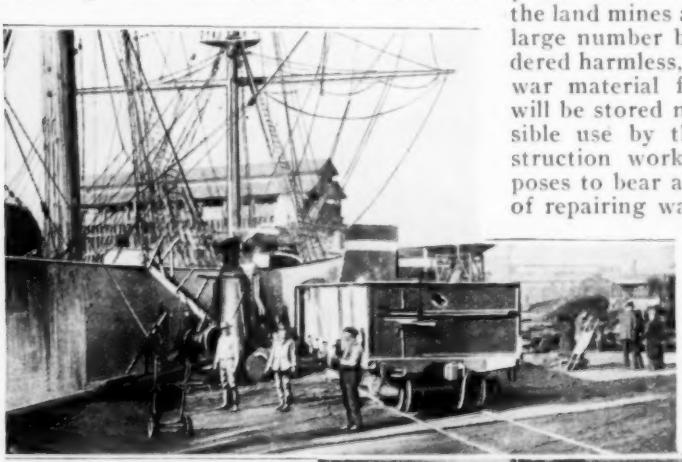
All of the Allied Nations were Represented in the Great Procession—One of the Features That Made the Celebration Extraordinary. These Are Chinese Students Costumed to Represent the "New China"

The Foreign Legations Vied with One Another in Producing Beautiful Floats. This One, Done in White and Flying the British Flag, Was a Striking Tribute to the Martyrdom of Edith Cavell

PHOTOS BY A. L. FLUDE

OIL, COPRA, AND SAND CARGO MIXED UP IN SHIP'S HOLD

A cargo, adequately described only by the word "mess," was removed by reluctant stevedores from a ship recently docked at San Francisco. The mess consisted of a random mixture of 7,600 bbl. of coconut oil, 2,500 tons of copra, and 500 tons of sand and rock ballast. The copra, or dried coconut meat, was spread loose upon the oil barrels to keep them from moving about in the hold. Some unanticipated process of oxidation, or fermentation, in the copra created enough heat to melt the semisolid oil, which leaked out of the barrels, soaked the copra, and ran down into the ballast. The ship came into port with four to seven feet of coconut oil in her bottom, a good portion of which was in the bilge, between the skin and the steel hull. The work of salvaging the cargo was characterized as the worst job in the history of the industry. It was necessary to pay stevedores time and a half to work on it, and the oil-soaked sand and rock had to be removed with pick and shovel, hoisted in barrels to the deck, shoveled into motor trucks, and carried to a concrete sump, with steam pipes along its bottom, to separate the unnatural composition. After two months of this work, a third of the cargo still remained in the hold. Disregarding the ship's waste of time, the loss is estimated at $250,000.



Hoisting Engines and Railway Cars Formed Only Part of the Equipment Used in Salvaging the Queer Cargo

The Mixture of Oil, Copra, and Sand was Hoisted Out of the Ship's Hold in Barrels, Shoveled into Motor Trucks, and Hauled to a Steam-Heated Concrete Sump So the Oil could be Removed

BRITISH TO RID FRENCH SOIL OF BURIED SHELLS

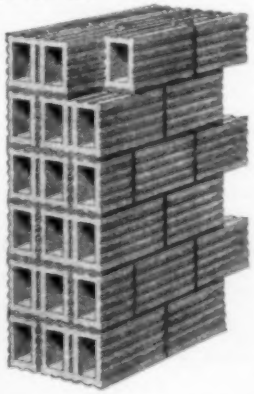
Popular conjecture has often pictured the plight of the farmer in northern France who should run the nose of his plow into the point of a buried shell, which, up to that moment, had failed to perform its function. That the danger is very real is demonstrated daily by explosions which, in some war-devastated districts, are almost constantly occurring. The high command of the British army, coöperating with the French authorities, is setting experts to the task of locating these buried menaces, which will then be removed or blocked up. At present cultivation of the soil is made dangerous by the presence not only of "dud" shells, but of the land mines and antitank charges laid in large number by both armies. Once rendered harmless, these and other abandoned war material found on the battle fields will be stored near railway points for possible use by the French people in construction work. The British army proposes to bear all the expense of this work of repairing war damage and making the soil of northern France once more fit for cultivation. Attempts to resume agricultural pursuits before the danger points were located and marked have already resulted in a number of casualties.

STORING SPRING FLOOD WATER FOR DRY-TIME IRRIGATION

Inability of cleared and prairie land to retain any of the abundant flood water which passes over it during a brief period naturally suggests means of impounding such water for gradual and regulated use over the drought season. Construction of storage ponds with a team and scraper is comparatively inexpensive, costing in Texas from $200 to $300 for a tank of 200,000 to 300,000-cu.-ft. capacity. Such a pond, 200 ft. long, 100 ft. wide, and 10 ft. deep, will irrigate from three to five acres, half the water being lost by evaporation. The pond is located in the habitual path of flood water, and the hilly land terraced to prevent fertile soil from washing away. The earth retaining dam must be made with great care, with its foundation on solid subsoil, and a concrete spillway provided for excess flow. Often natural depressions can be utilized to save excavating. In parts of west and southwest Texas large windmills, operating deep wells, keep the ponds from going dry.

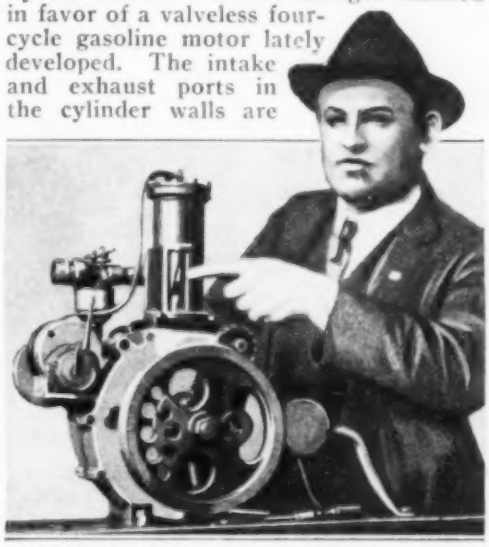
IMPROVED BUILDING TILE MAKES STRONG WALLS

Hollow tile, formed in single and double units, properly proportioned, can be laid to form a wall in which no two joints come together. Such an arrangement was sufficiently original to form the basis for patent rights, and tile is now manufactured to build walls whose thickness may be any multiple of 4 in., and in which all vertical webs are continuous from bottom to top. The partition that divides the double-size tile is itself hollow, making it correspond in all respects to a pair of single tiles laid side by side. The single tile is laid outside in one course, inside in the next course, and so on. Reinforcing bars may be run vertically through the wall without cutting the tile or breaking the interlocking bond. The size of the tile, 11½ in. long and 5½ in. high, corresponds to standard brick dimensions.



CUP-SHAPED PISTON IS USED IN NOVEL VALVELESS MOTOR

Quietness, high efficiency, and simplicity are some of the advantages claimed in favor of a valveless four-cycle gasoline motor lately developed. The intake and exhaust ports in the cylinder walls are opened and closed by rotation of the piston. The revolving motion is imparted by a worm gear on the drive shaft through a keyway in the sides of a cylindrical sleeve, in which the piston operates. The latter is nearly twice as long as is customary, but is cup-shaped at the top so that the explosion head is inside, near the middle. Ports in the upper part of the piston register with those in the cylinder wall in the course of the revolutions. The claim for efficiency is based on the contention that better scavenging is obtained than with a motor using poppet valves, and that the cylinder is filled more satisfactorily on the intake stroke. Also, no power is lost through the lifting of valves and the compression of valve springs. Elimination of cams, valves, and push rods obviously is in the interest of quietness.



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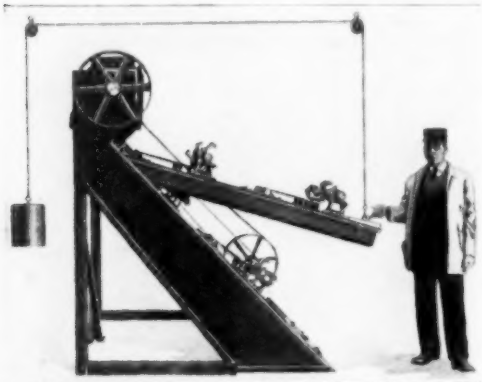
Working Model of the Valveless Motor: The Man Points to the Exhaust Port Which is Opened and Closed by Rotation of the Piston

SEPARATOR SCREEN VIBRATED BY HARMONIC IMPULSES

Taut wires vibrate when periodical blows are struck upon a resonant surface near them. This is the principle used in vibrating the screens of a new inclined-type separator for rock products. Slow-speed, cam-operated hammers fall upon

metal bridges, and the vibrations are transmitted to the screens without direct contact. The fine screen is protected by a coarse, or scalper, screen, and both are



In This Material Separator the Screens are Vibrated by Hammers Striking on Tense Metal Bridges. The Hammer-Actuating Cams are Seen on the Lifted Cover

easily accessible. Because of the angle of inclination and the rapid and violent vibration, a comparatively coarse and sturdy screen yields a fine and uniform product without clogging the pores. When the cover, carrying the hammers and their mechanism, is lifted, the scalper screen slides out like the drawer of a cabinet, exposing the clear surface of the fine screen. Both screens are stretched by turning a few nuts. Unit construction permits a battery to be built up of two or more separators.

AUTOS RUN ON PLANK RAILS ACROSS ALKALI DESERT

Planks laid on the scorching alkali sand for 17 miles have made it possible to drive an automobile across the terrible Mammoth Wash in about 40 minutes. In the old days it was not unusual to spend the better part of a week on that short span of the Borderland Trail from Phoenix, Ariz., to the Imperial Valley, Calif. Many tourists took the Midland Trail, 250 miles out of their way, to avoid the nightmare of bottomless alkali dust and blistering desert heat. The plank path that dispels the terrors provides two 3 by 8-in. planks for each wheel track. They are nailed to stringers of the same dimensions, placed about 10 ft. apart. Frequent turnouts take care of passing cars, the rules of the desert giving the right of way to westbound traffic.

Laying Three by Eight-Inch Planks across 17 Miles of Alkali Desert to Enable Autoists Cross in a Jiffy This Formerly Almost Impassable Bad Land in Southern California

ENVELOPES FOR SOLDIERS ADORNED IN NOVEL WAY

Envelopes having cartoons of soldiers printed on their faces recently have become very popular with army men in certain camps. These imprints give the soldiers' mail a distinctive character which

Envelopes Having Cartoons Printed on the Face are Becoming Popular with Soldiers for Souvenirs as Well as for Regular Correspondence

they like. The envelopes are suitable for use as souvenirs as well as containers. The cartoons are printed in red, green, purple, and other shades.

DEADLY PHOSGENE WAR GAS FINDS PEACEFUL TASK

Phosgene gas, deadly compound of chlorine and carbon monoxide, has been offered an occupation for peace time. It has been found to serve as an effective bleach for sand. This action it accomplishes by destroying the iron oxide which is responsible for the reddish or brownish tints of the sand. Bleached sand is used in the manufacture of fine glass for optical and eyeglass lenses. There are no less than 121 varieties of such glass, all of which may now be readily produced in the United States, adding one more to the industries no longer dependent upon imported products.

WEEKLY REMINDER REPLACES POCKET NOTEBOOK

Pocket notebooks abound in all forms and varieties, many of them so substantially made that they long outlive their usefulness. A little eight-page vest-pocket size "reminder," issued as an advertising novelty, has the advantage that it is only intended to last a week, at the end of which a new one is substituted. In its 3 by 8-in. space it includes blanks for "Things to Do," names and addresses, telephone numbers, engagements, letters to write, memos, a "scribble sheet," two pages of cash accounts, a calendar for two years, an "emergency list" of things to attend to during the week, and as a finishing touch an 8-in. ruler graduated in eighths.

"FLU" MASK FAILS TO STOP INVENTIVE SMOKER

Compulsory wearing of "flu" masks, which became quite common during the recent influenza epidemic, put a temporary but effective stop to smoking on the street in the afflicted communities. An inventive machinist in San Francisco, however, got around the difficulty by cutting a small hole in his mask and pasting a round corn plaster on each side. The cigarette is inserted through this hole, which is corked when not in use.

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Two Round Corn Plasters Protect the Cigarette Hole in the "Flu" Mask. Between Smokes It is Stopped by a Cork, as Seen at the Right

TWO-SEATER "SPAD" HAS NOSE AHEAD OF PROPELLER

In several respects the new two-seater "Spad" biplane of the French air service is strikingly individual in design. Its chief novelty lies in the body construction. The nose contains the gunner's cockpit and is separated from the fuselage proper by the propeller, which is set within the leading edge of the top plane. The center section of the latter, therefore, is cut away on the leading edge as well as on the trailing one. Division of the body by the screw is not a strictly new idea, for it was employed several years ago in the American-built Gallaudet seaplane. As found in the Spad, however, it is unusual. The nose section is supported by two struts connected with the landing chassis, and is also held by members that join the upper wings. Ailerons are provided on both planes.

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Side View of the Interesting "Spad" Two-Seater Biplane, with Propeller Dividing the Body in Two Sections: The Gunner's Cockpit is Supported by Struts Connected with the Landing Gear

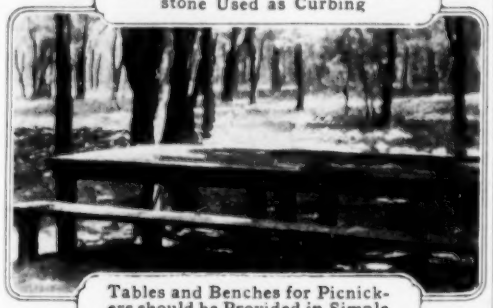
AMERICAN ARMY HAS ON HAND MILLIONS OF CANDLES

At the signing of the armistice the American Expeditionary Forces found they had in their possession 46,000,000 candles, made according to army specifications. Each candle will burn 10 hours. If burned one at a time continuously, it would require 52,511 years to use up all these candles. However, though they were intended primarily for trench use, probably the supply is sufficient only for immediate needs, it is said, in a statement authorized by the War Department. The candle still remains the simplest and most reliable of portable luminants.

Simple and Effective Support for Vines: It Also Shows Cobblestone Used as Curbing

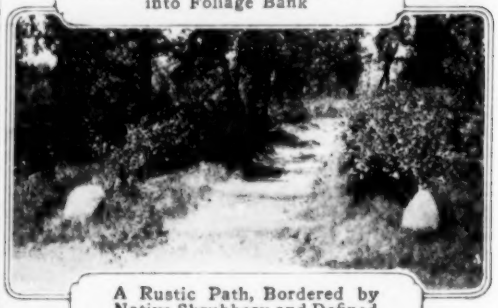
Rustic Entrance for a Small Park, to be Built of Timber Felled during the Process of Developing the Park

Here is Shown the Use of Evergreen to Bring Greater Variety into Foliage Bank



Tables and Benches for Picnickers should be Provided in Simple Form

Typical Plan for a Park of 25 to 50 Acres, Suitable for the Recreational Use of 5,000 People



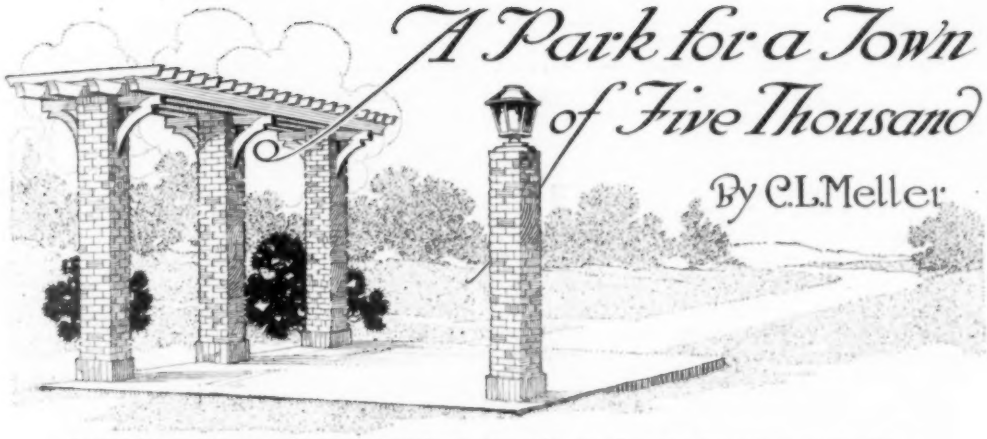
A Rustic Path, Bordered by Native Shrubbery and Defined by Two Bowlders

Nothing Need be Wasted; a Hewn Log Makes a Good and Picturesque Bench

Simple and Effective Arrangement of Stone at End of a Culvert

A Park for a Town of Five Thousand

By C. L. Meller



Brick Pillars, Elaborated into a Pergola at One Side and Carrying a Lantern at the Other, Form a Very Effective Entrance. Concrete may be Substituted for Brick, and a Parapet with Urns for the Pergola

IN the landscape architect's ideal conception of an acre of park for every hundred inhabitants, there is no guide for calculating park space appropriate to a town of 5,000. It is evident that an acre more or less would not be a determining factor in its value. The problem of relative size is really a local one, its answer depending on the community's facilities for outdoor enjoyment, on the benefits that will accrue to it by the acquisition of a park, and on the specific idea which lies behind the desire for a park.

The commemorative motive is peculiarly appropriate in park planning just now. Every town has its returning heroes, and perhaps some who return only as names on a dreaded list. That alone, while it has little to do with size, is a sufficient justification for all necessary expenditures, linking the park permanently with the warmest and strongest associations of the community. The motive may be perpetuated in a suitable memorial to be placed near the park entrance. An appropriation of $2,000 for this would not be too much.

Camping and picnicking, two legitimate park uses, both suggest an appeal to the motorist. A good camp site is preëminently adapted to the attraction of strangers, thereby bringing some added trade to the town merchants. For the campers good drainage is essential. Adequate sanitary provision calls for two wooden outhouses, costing perhaps $20 apiece. Water supply is necessary, an extension of the city system unless a natural spring—always preferable from the camper's standpoint—be fortunately available. While the present amount of automobile traffic will help in estimating the camping area, the attraction once established is likely to bring more traffic. A tentative allotment of five acres will allow later development. A picnic ground has greater appeal to the local population, though it, too, will draw pleasure seekers from neighbor communities. Grass and shade are the main requirements, to which should be added tables and benches arranged to accommodate several groups without interference. Fireplaces of simple design are inviting and useful. Another five acres may be set aside for the picnickers.

Top View: A Fireplace Simply Constructed of Concrete Blocks from an Old Foundation Held Together by Concrete. Iron for Such a Fireplace may be Procured at a Junk Dealer's. Lower View: A More Elaborate Fireplace with a Chimney, Built of Brick

Provision must be made for play, both juvenile and adult. A few seesaws among the trees, rope swings hung from the branches, baby swings, and a generous sandpile—at least a carload—take care of the children. A level, even area, large enough for at least one or, better, two baseball fields, can also be used for football and other games as the season changes. Ten acres is ample, four acres the minimum, for this purpose. If natural skating surface does not offer, some means of flooding the field in winter might be studied out. A flagpole may be installed at one side of the field.

Since a park should emphasize natural beauty, one part of the site will best be left nearly as nature made it. This will be the elastic unit of the park; it may be as large as conditions allow, and it may be encroached upon for other purposes as the usefulness of the park grows.

A total area of 25 acres, apportioned as indicated, will make a very satisfactory park. We may regard 50 acres as the maximum, and 15 acres as the irreducible minimum. The plan must follow the site, laying out broadly and boldly the way the park is to grow, but leaving details to develop gradually, in sympathy with the desires of those who use it.

The approach proclaims the park. Therefore a fitting entrance is the first important consideration. If the park is near the business section of the town, extending the approach to the main street, by means of a parking strip planted to trees, is very effective. Such a strip, extending for one block along the middle of the street from the park entrance, with pillars of suitable design at the end, will cost not less than $500. Formal park-entrance pillars of brick or stone may be elaborated to a vine-draped pergola on each side, costing complete at least $350. Or a rustic entrance, to harmonize with a wooded area, may be constructed of timber from the clearing of the site. Only sound logs and limbs of durable wood should be used. For such an entrance of appropriate size, 200 hours of labor must be allowed.

A flower bed curbed with field stone, so placed as to divide incoming and outgoing traffic, will need at least a thousand geraniums to be effectively in scale with the rest of the park. Maintenance expense for this will run $100 a year, which may be reduced to about $30 by substituting such annuals as petunias or verbenas. Edging plants will add a few more dollars, and planting may be figured at 40 hours.

A driveway should skirt the greater area of the park a fair distance from the boundaries, returning to the entrance in an easy and natural manner. A dirt road, whose maintenance requires only a drag, is usually sufficient. Holding traffic to one direction will save road width, and inconvenience nobody; and it may be closed in wet weather to reduce upkeep. The road's course should take advantage of all natural views and objects of interest. After the driveway is roughed out (not forgetting an automobile-parking area) it will be developed by the labor employed in park maintenance, and so has no definite cost figure.

The Japanese Type of Swing Seen at the Left has Proved Very Popular with the Children, and is Easily Made from the Timber Felled in Clearing the Park

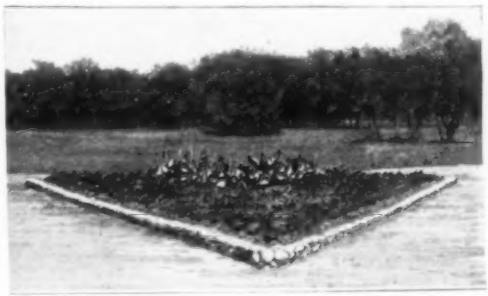
Well-Located Stumps Need Not be Pulled; Frequently, with a Little Ingenuity, They can be Made into Comfortable and Attractive Seats Like the One Above

Felled timber will be useful for benches of various design, for rustic railings and bridges, for seesaw horses and swing uprights. Properly located stumps are easily made into seats. The cost of a seesaw is about $7, while baby swings call for an investment of at least $20. Tables and benches should be strongly built, and anchored to the ground. Varying with the locality, the cost will hardly be less than $8 for a table and two benches. Rocks have their uses, in moderation, as retaining banks for terraces, markers for path terminals or intersections, or to define the drive where the land slopes toward it. A pile of stones at the ends of a culvert helps retain the soil. Fireplaces for the picnickers will cost from $3 to $5, for a simple concrete hearth, and $15 or more, for a brick structure with a chimney. Use of field stone or other waste material eliminates a specific cost figure. Make the fireplaces of ample size, comfortably high, and with a fire pit not more than 10 in. deep. From the picnic ground the play field should be especially accessible. Heavy stumpage can best be blasted out, and a good grade obtained by plowing, disking, scraping, dragging, and rolling.

Formal planting should be restricted to a small area near the entrance. Masses of flowering annuals to begin with, worked over gradually to herbaceous perennials, such as peonies, phlox, and delphinium, outlined in free curves against a background of shrubbery, can scarcely fail to produce a pleasing effect. Vine supports work into such a picture nicely. Such sturdy, self-reliant perennials as iris, peonies, etc., in large masses, will stand setting apart from their background. Planting for the rest of the park should not be elaborate, and the use of natural material is best. Clumps of shrubbery, at the edge of timber and in places along the drive, will attract a variety of birds. Ferns can gradually be established in the woodland, the wild native bloom being studied as to its requirements for shade or sun. Interesting plants and vines can be found for steep and rocky hillsides. Few paths should be prepared, and those narrow and inconspicuous.

Land prices are a local problem, but other charges are roughly standard. A typical 25-acre park, designed as described here, has cost, for development and maintenance in the last seven years, a total of $10,270, or $1,500 a year. The hand labor for the seven-year period cost $2,500, at 20 and 25 cents an hour. Team labor cost $1,050 at 50 and 70 cents an hour. Policing cost $6,720, at $80 a month, which included all caretaking. The man selected for this post must be tactful, industrious, a fair craftsman, and have a high degree of interest and pride in the park. These, of course, are pre-war figures.

We have not discussed the subject of buildings. The purpose of a park building varies with the climate, the location and natural advantages of the park, and



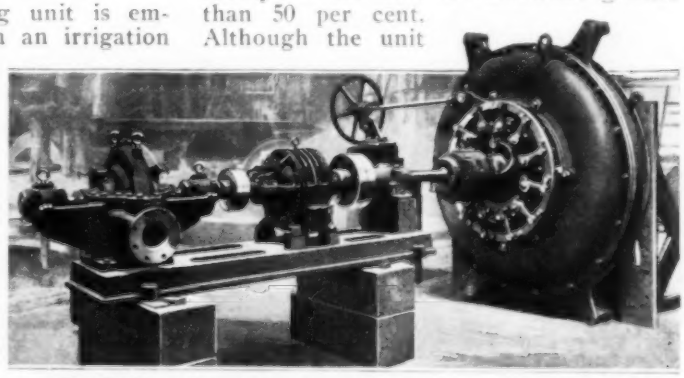
A Formal Flower Bed near the Park Entrance, Curbed with Stone, Serves as a Divider for Incoming and Outgoing Traffic

could scarcely be built to keep harmony with the rest of the plan for less than $3,000. If one is contemplated, it should contain toilet facilities and be heated in winter. A place for music may be included, and perhaps a stand for refreshments, etc. The latter problem is well solved by making the stand a concession, returning a small profit.

Allowing for variations from the figures named, an annual expense of not to exceed $2,000 will provide a town of 5,000 with a park that will adequately serve all the needs of the people and be a perpetual credit to the community.

INTERESTING WORK IS DONE BY HYDRAULIC UNIT

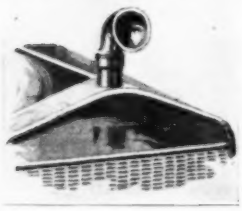
Quite a novel pumping unit is employed in connection with an irrigation project in the state of Washington. Its application at first thought seems somewhat like lifting oneself by the bootstraps. The installation consists of a hydraulic turbine directly connected through speed-increasing gears, to a centrifugal pump. The water wheel operates under a 20-ft. head, and at 350 revolutions produces 35 hp. The pump, on the other hand, working at 1,450 revolutions, elevates about 800 gal. of water a minute against a head of 115 ft. It is the speed of the pump, of course, that compensates for the great inequality in the relative heads. The efficiency of the unit is somewhat greater than 50 per cent. Although the unit itself can hardly be called unusual in character, the work it does is at least sufficiently novel to be interesting.



The Turbine, Operated under a 20-Foot Head, Drives, through Speed-Increasing Gears, the Pump Which Elevates Water against a 115-Foot Head

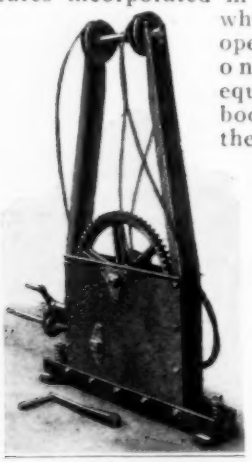
DIMINUTIVE SHIP'S FUNNEL AIR INTAKE FOR RADIATOR

To aid the cooling system of an automobile, an air-intake spout, designed in miniature to resemble a ship's funnel, has been evolved as a radiator cap. It aims to assist in forestalling overheating by allowing an inrush of cool air to reach the inside of the radiator. A screen is provided in the funnel opening for the purpose of excluding dust and other foreign particles.



HAND-OPERATED TRUCK HOIST WORKS WITH GOOD SPEED

There are a number of serviceable features incorporated in a new hand hoist which has been developed for installation on motor trucks equipped with dump bodies. Chief among them, perhaps, is the speed with which the device performs its function. It enables a single operator to elevate a loaded dump body to an angle of about 50° in less than two minutes. The mechanism is compactly housed and occupies only about eight inches of space behind the driver's seat. Furthermore, it is but five feet in height, which allows the truck on which it is installed to pass through an ordinary shed or garage doorway. Power is applied through a double set of gears, and transmitted to a drum about which steel hoist ropes are wound. A five-ton load, it is said, can easily be raised by one man at the crank.



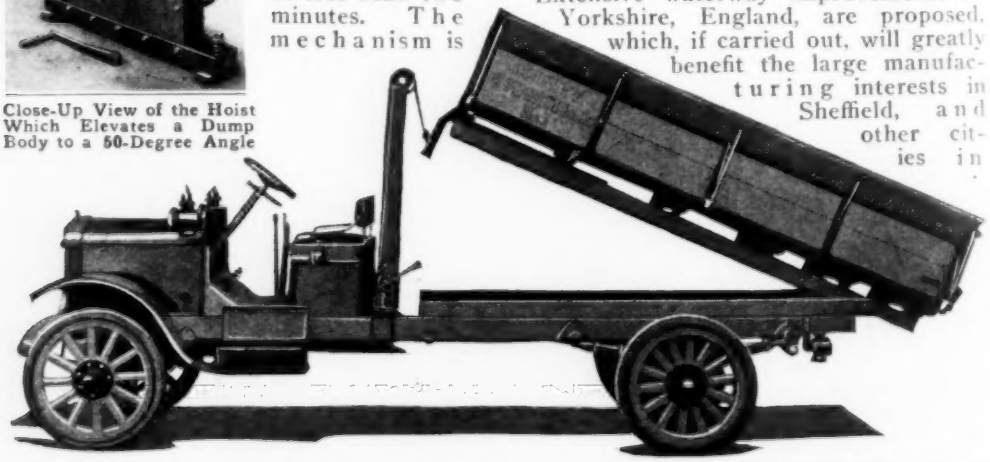
Close-Up View of the Hoist Which Elevates a Dump Body to a 50-Degree Angle

OPTICAL ILLUSION IS MENACE TO OPEN-WATER BATHERS

Attention has been called to an optical illusion that may be responsible for the drowning of many bathers. When swimming with a strong wind, one moves more slowly than the waves and consequently often suffers the mistaken impression that he is being carried backward by an offshore current or "undertow." Panic frequently seizes the swimmer, especially if he is inexperienced in open water, causing him to increase his effort and quickly exhaust himself, with fatal result. Obviously, therefore, it is always well to estimate progress by sighting a fixed object ashore. Watching the waves go past one is analogous, in the sensation it produces, to watching a forward-moving train from a window in a stationary car alongside. All of which recalls that coolness of mind is always a prerequisite of safety.

SHEFFIELD, ENGLAND, SEEKS IMPROVEMENT OF CANALS

Extensive waterway improvements in Yorkshire, England, are proposed, which, if carried out, will greatly benefit the large manufacturing interests in Sheffield, and other cities in



This New Quick-Acting, Manually Operated Hoist for Motor-Truck Dump Bodies Usurps Only About Eight Inches of Space behind the Driver's Seat

These Motorcyclists are Competing for the Honor of Riding the Smallest Possible Circle in a Pit of Soft Sand. The Winner has Just Taken a Header in His Nine and One-Fourth-Foot Circle

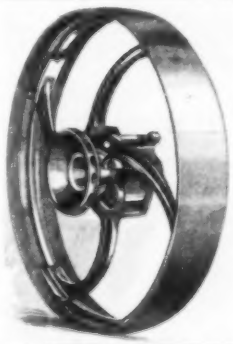
north-central England, enabling them to send shipments by small steamers to Humber River ports, and thence abroad. In order that the project of widening and deepening the system of canals forming the route may be carried out, it is urged that either the national government or the municipalities interested take the matter in charge. One of the regions which would derive important benefit would be the Doncaster district, 18 miles down the canal from Sheffield, where great coal fields have been opened up in recent years. Steel and iron manufacturers at Sheffield have not been able to use the existing canals extensively, owing to the loss of time involved.

MOTORCYCLISTS IN CONTEST RIDE CIRCLES IN SAND

Riding the smallest possible circle in the softest possible sand is an ingenious diversion that occurred to a party of motorcyclists visiting Exposition Park, Los Angeles, recently. The impromptu rules of the odd contest provided that the rider must neither fall off nor put a foot down to save himself from falling. The first rule was honored mostly in the breach, and all eight contestants flopped into the sand a number of times. The winner, after five headers, completed a circle with a diameter of 9 ft. 3 in. His nearest opponent made an even 10-ft. circle. The rear wheels of some of the motorcycles ground themselves into the sand until they had to be lifted out. This soft, fine, yielding surface not only tried the skill of the riders but tested the mettle of the motors.

SHOCK-ABSORBING PULLEY FOR CREAM SEPARATORS

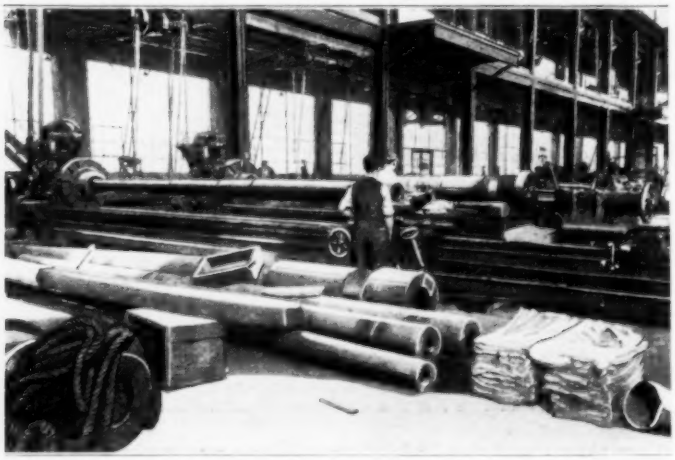
Of probable interest to dairymen is a flexible pulley lately developed for engine-operated cream separators. It permits gradual, smooth starting without belt shifting, and absorbs the shocks transmitted from a gasoline engine. The spokes are made of resilient metal and bend when subjected to a sudden jerk or pull. They are hinged at the hub and fitted with shoes that engage the rim of the wheel frictionally.



¶ Based on the pre-war building record of 385,000 residences a year, there is a present shortage of 700,000 residences caused by the low construction figure of the last four years. There is an equivalent shortage in other building lines. The normal annual value of building operations in the United States is $3,000,000,000.

LONG LATHES REQUIRED TO BORE BIG GUNS

In the great shops, so carefully guarded during the war, where the army's and navy's big guns are made, the long lathes attract special attention. Some of these are shown in the accompanying photograph, the two in the foreground being 28-ft. machines. The first one is boring a 3-in. gun tube and the second one is turning a 3-in. gun jacket, which eventually will be shrunk onto the tube.



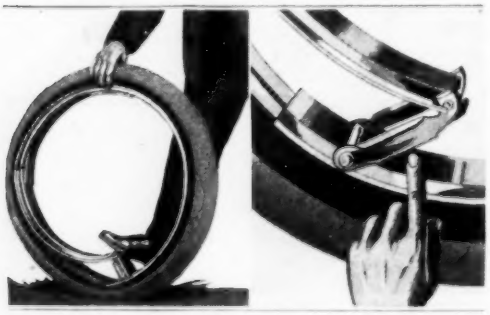
Making Big Guns for the Government: The 28-Foot Lathe in the Foreground is Boring a Three-Inch Gun Tube, and the One Just beyond It is Turning a Three-Inch Gun Jacket

SAND BARS AT FIRE ISLAND SHIFT THEIR PLACES

The sand is creeping up on Fire Island. The narrow key that lies just south of Long Island has been shifting its landmarks for years. That the changes are not confined to the visible terrain is manifested by the stranding of ships on strange bars off Great South Bay Beach. Here it was that the transport "Northern Pacific" went ashore, a few miles east of Fire Island lighthouse. Almost four miles inland from Point Democrat the lighthouse stands; and it was built out in the water. It has not moved; the sand has merely come up and surrounded it. The old baymen know the bottom foot by foot, but even they can hardly keep track of the almost hourly changes wrought by the creeping sands. And when a ship does go aground, the sand seizes upon it and piles in around it until refloating is no small task. Strandings are frequent here, but casualties are few because the shore is hospitable to shipwrecked mariners.

SEGMENTED AUTO RIM PERMITS QUICK CHANGE OF TIRES

Real novelty is found in a new type of motor-car rim that permits a tire to be changed quickly without resort to the usual tools and muscular energy. The rim consists of three hinged sections, and when removed from a wheel, is instantly collapsed by bouncing the tire lightly against the floor or ground. It is as easily replaced, for by pressing against one of the hinges with the foot, the rim assumes its natural contour, and locks. Old rims can be converted to the new form.



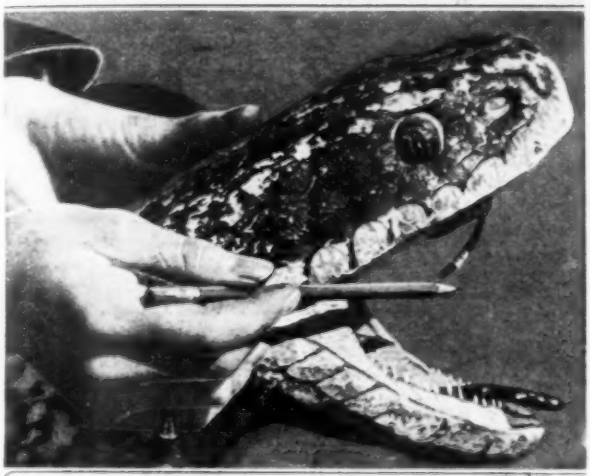
At the Left is Shown How Easily the Rim is Replaced, While at the Right Is a Close-Up View That Explains How the Sections are Hinged

HOT-AIR DRYING PROCESS FOR FOOD PRODUCTS

An iron cylinder, 16 ft. in diameter, in which revolve two turbine-driven metal wings, is the mechanism used in a new European process of drying eggs, fruit juice, blood, and the like. The fluid, beaten to a froth, is dried by a continuous current of hot air through the cylinder. The dried products, in powder form, are soluble in water and undergo no chemical change. The early erection is announced of plants of this kind for handling 140,000 eggs a day. The powdered food will keep indefinitely.

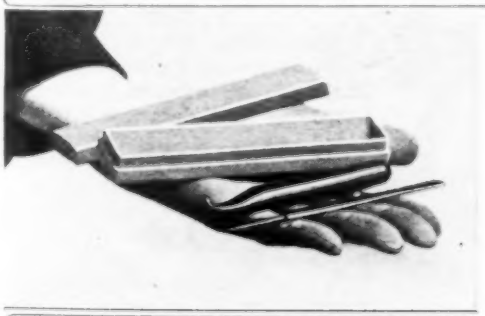
AMATEUR DISPLAYS SKILL AS SNAKE CHARMER

Holding Down a Rattlesnake with a Forked Stick: A Student in Haverford College, near Philadelphia, has Made Capturing Poisonous Snakes His Hobby, and the Pictures on This Page Indicate the Familiarity and Fearlessness with Which He Handles the Reptiles



Using a Large-Scale Model of a Rattler's Head to Indicate the Location of a Poison Fang: When the Jaws are Closed the Member Lies Flat against the Roof of the Mouth, While the Opening of the Jaws Causes It to Swing Downward So That It Enters the Flesh When the Snake Strikes

Treating a Snake Bite: After the Bandage has been Bound Tightly about the Arm, the Amateur Snake Charmer Holds Its Free End in His Teeth While He Cuts about the Wound and Applies Permanganate of Potash

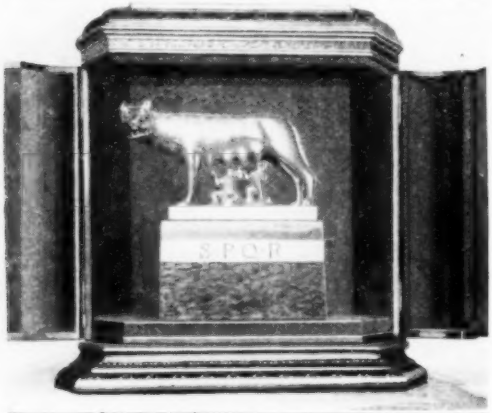


The Daring Young Performer has been Bitten a Number of Times and So Always Carries This Anti-Snake-Poison Outfit with Him When He is Handling Venomous Specimens. It Consists of a Scalpel for Making Incisions about the Bite, and a Vial Containing Permanganate of Potash

A Handful of Rattlesnake: This Holding of a Coiled Rattler in the Outstretched Palm Is One of the Stunts of the Young Performer Which Always Makes His Fellow Students Gasp and Shudder. They Know, However, That He Understands Just What to Do, the Instant There Is Any Sign of Hostility

ROME PRESENTS GOLD REPLICA OF STATUE TO MRS. WILSON

Distinctive among the multitude of gifts to President and Mrs. Wilson from Europeans is a small gold replica of the famous statue of the wolf suckling the infants Romulus and Remus, the traditional founder of Rome, and his brother. The costly souvenir, which was presented to Mrs. Wilson by the mayor of the Eternal City, is inclosed in a richly finished cabinet. Modern Romans are particularly proud of the great age of their city and delight to keep alive its many legends, including the story of the nurture of the babes by a wolf.



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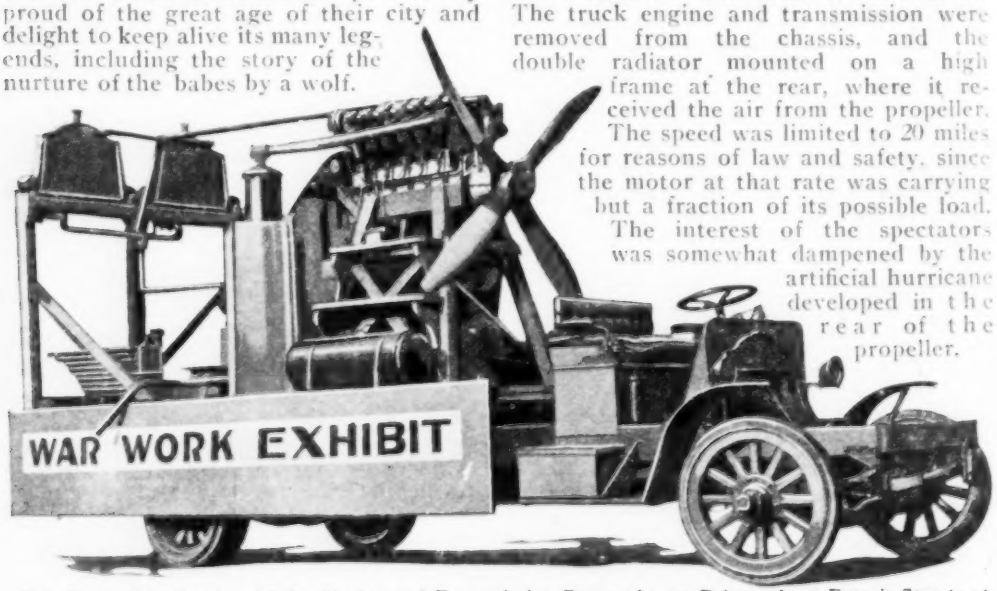
Gold Replica of Famous Statue, Presented by the Mayor of Rome to Mrs. Wilson: The Letters Stand for Latin Words Meaning "The Senate and People of Rome"

WAR INDUSTRIES OF FRANCE PLAN PEACE PURSUITS

Industrial plants in France which were devoted to the manufacture of war materials are changing the nature of their products with as little friction and loss as possible, being assisted in solving their problems by the Department of Industrial Reconstruction, which was formerly the Armament Department. Some of the changes being made are the use of the great arsenal at Roanne for the construction and repair of railway material, the transformation of the explosive factories at Bourges into chemical plants with the production of fertilizers in view, the alteration of woodworking shops of the air-craft department for sash and door and other building work, and the manufacture of telegraph and telephone material and other metal products by plants which have engaged in similar lines. These changes include both the converted industries and the factories built expressly for war work, and apply both to the liberated regions and to the rest of France.

AIR PROPELLER AND MOTOR DRIVE HEAVY TRUCK

A four-blade airplane propeller, coupled to a 450-hp., 12-cylinder Liberty motor, pulled a three-ton truck chassis around Detroit streets at 20 miles an hour in a manufacturer's war-work demonstration. The truck engine and transmission were removed from the chassis, and the double radiator mounted on a high frame at the rear, where it received the air from the propeller. The speed was limited to 20 miles for reasons of law and safety, since the motor at that rate was carrying but a fraction of its possible load. The interest of the spectators was somewhat dampened by the artificial hurricane developed in the rear of the propeller.



This Three-Ton Truck, with Its Engine and Transmission Removed, was Driven about Detroit Streets at 20 Miles an Hour by the Four-Blade Airplane Propeller and 450-Horsepower Liberty Motor

MECHANICS ASSEMBLE BIPLANE QUICKLY AT TEXAS FIELD

DURING "open house day" at Rich Field, Waco, Texas, some weeks ago, this two-seater army biplane was uncrated and completely assembled in two hours and 16 minutes. A crew of five accomplished the feat. The speedy quintette, their task finished, are seen standing about the plane, while the flier who tried out the hastily but perfectly assembled machine leans over the rear cockpit.

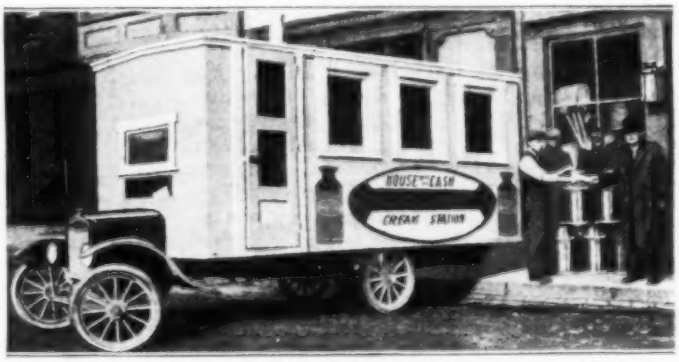
USE OF BALES SAVED LUMBER AND GAVE ARMY SANDBAGS

Clothing and equipment for the American Expeditionary Forces was packed by baling instead of boxing or crating. The sum saved by this substitution amounted to more than $50,000,000. Cargo space of 8,180,000 cu. ft. was saved, or 204,500 shipping tons, equaling the capacity of 41 standard cargo ships. The lumber necessary for crates and boxes would have been 58,000,000 ft., which amount is estimated to take 30 years to grow. The quantity of burlap used for baling, which allowed this enormous saving of wood, was 2,770,000 yd., the jute grown in one year being sufficient to manufacture that amount. The burlap was cut the right size to be made into sandbags for military use, and from the total shipment of 1,000,000 bales of goods enough burlap was taken to make 4,000,000 sandbags.

¶The statue of Lincoln, by St. Gaudens, is to be placed in the Canning inclosure at Westminster, London, according to a recent decision of an American commission appointed to choose between it and the much-discussed statue by Barnard.

TRUCK EQUIPPED FOR TESTING CREAM WHEN BOUGHT

The slogan "cash and carry" has been adopted by a buyer of cream who has built a special body on his light car, for the purpose of running his business on the new basis. The body, resembling that of a van, is of wood with large windows on either side and has a capacity for 40 five-gallon milk cans, in addition to a complete cream-testing outfit installed in the car. The novel-looking conveyance is driven from farm to farm, and the cream purchased is tested and paid for on the spot, so that there is no ground for complaint. The plan also does away with a more or less elaborate system of bookkeeping.



Auto Truck Equipped by an Ohio Dealer in Dairy Products for Testing Cream at the Place Where It is Purchased: The Buyer Pays Cash in Each Case

NEED FIVE MEN TO OPERATE SPADE IN CHOSEN

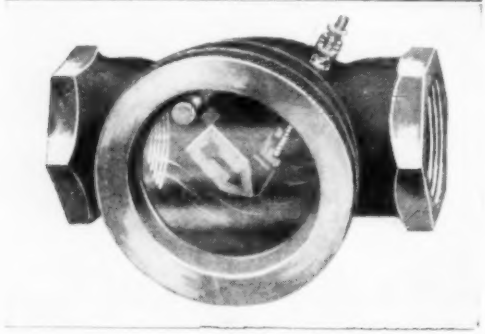
Things are done differently in Chosen. In parts of that country, where primitive methods still prevail, spading a garden,

Primitive Land Cultivation in Chosen (formerly Korea): The Man at the Rear Operates the Handle of the Implement While the Other Four Jerk the Blade Along, Loosening Up the Soil

for instance, is often a five-man job. Four coarse ropes of twisted reeds are fastened to the heavy spade, and after one of the five laborers has thrust it into the ground the other four jerk it along, stirring up the earth, after a fashion.

DUAL CIRCULATION INDICATOR FOR EXPLOSION MOTOR

Instant warning is given by an electric and sight-flow indicator of British manufacture, when the circulation of water in the jackets of a marine or other type internal-combustion motor falls below normal. The instrument is provided in different sizes, that accommodate pipes of from ¼ to 4-in. diameter. The relative



BY COURTESY OF MOTOR SHIP AND MOTOR BOAT

Visual and Electric Indication of the Condition of the Flow of Water in the Circulating System of an Internal-Combustion Engine is Given by This Instrument

amount of water passing the glass is shown by the angle assumed by an arrow fixed to a hinged flap. When the circulation is normal, electric contacts are held against the latter member. The tension of springs, however, overcomes the pressure of the water when the force of the latter drops below the safety point, moving the contacts away from the flap and causing the warning signal to function.

CHOKED BY TOY BALLOON LODGED IN LARYNX

The danger that lies hidden in the thing generally regarded as most innocent and harmless was made distressingly apparent by the death of a little Brooklyn girl of six years, who was strangled by a common toy balloon, purchased for a nickel. With the neck of the thin rubber bag in her mouth, the child was amusing her companions by blowing it up and suddenly drawing the air from it again. The end of the balloon became lodged in her throat, and the next exhalation so expanded it that it completely filled her mouth, shutting off all air. Unable to make a sound, her predicament was not realized until, in a few seconds, she fell unconscious, and the physician immediately called reported that death had probably been almost instantaneous. While such an accident is fortunately unusual, it carries a caution as to the devices used by small children in play.

PAUPERS' LEGACY TO CITY SOLD AT AUCTION

In Pittsburgh, Pa., some days ago the trinkets of the city's pauper dead were sold at public auction. The sale itself was a commonplace affair, such as is held in nearly every large city occasionally. For the seeker of human interest, however, it offered bountiful leads to stories of pathos and tragedy. The meager personal property of scores of unfortunate men and women deceased was sorted, classified, and put on the block for the highest bidders. The articles were the worldly possessions left by known and unknown individuals who had died in Pittsburgh charitable institutions during the 26 years prior to 1914, and included some 400 watches, a large number of keys, penknives, buckles, lodge emblems, scarfpins, false teeth, and a miscellaneous collection of odds and ends. Bibles printed in many languages, and coins from the four corners of the earth, were listed. A few hundred dollars of United States money, part of the paupers' legacy, was turned into the city treasury.

FIFTY THOUSAND SOLDIERS NATURALIZED ABROAD

Out of the vast army which the United States sent to Europe, 50,000 soldiers, who were aliens or alien enemies when they left this country, have been made citizens. This remarkable record, evidencing a splendid loyalty, has been made possible through the efforts of the Bureau of Naturalization which sent its representatives abroad to confer the privileges of citizenship on all foreigners in our armed forces. The detailed record of each soldier, possessed by the army, permitted the work of naturalization to be carried on rapidly but nevertheless thoroughly. Even alien enemies, who had joined our forces before present restrictions were in force and could prove their loyalty, were permitted to become citizens and will enjoy all the privileges of Americanism in civil life.

TREES IN CROWDED CITY HAVE SPECIAL PROTECTION

Authorities in New York City have gone to unusual trouble and expense to make certain trees grow in much-frequented paved areas. Each tree is planted in a hole, measuring 4 by 6 ft. and 3 ft. deep, and the roots are covered with properly enriched soil. Over the replaced dirt is laid a two-piece iron grating, having an 18-in. hole in the center for the tree. A special implement, which can be inserted through the grating, is used to mulch the soil, onto which fluid fertilizer is poured at intervals. Heavy iron pickets surround the tree trunk, a necessary protection in a crowded city.

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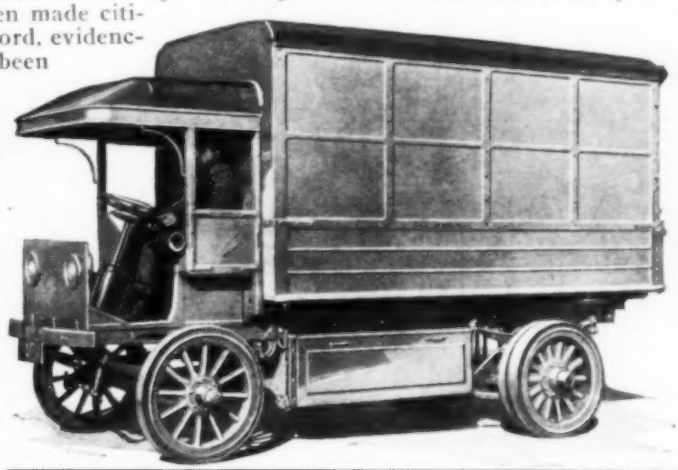
TRUCKS OF IMPROVED DESIGN FOR EXPRESS COMPANY

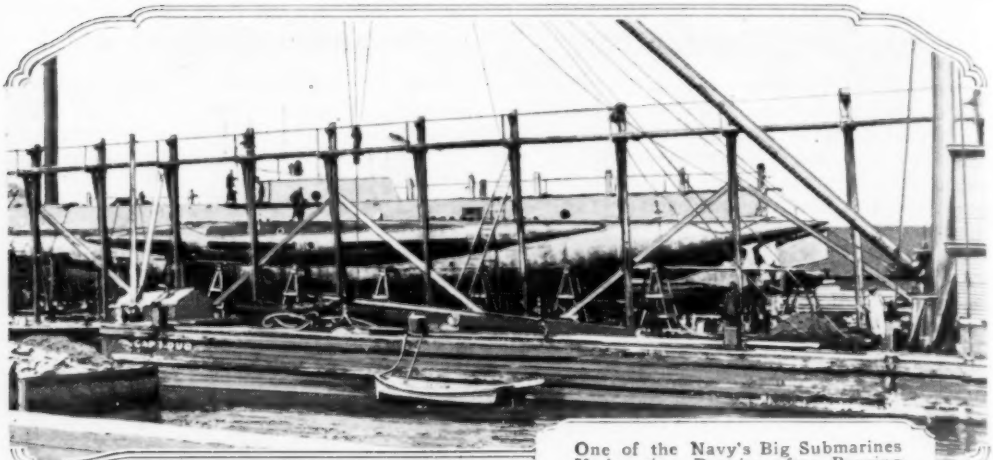
Several improvements characterize the new type of truck bodies which have been developed for the American Railway Express Company. In place of the screens and side curtains used in the old style of express carriers are eight panels on each side, which can be removed individually like window glass and replaced in case of damage. No mudguards are provided but at the lower edge of the sides of the body are iron "fins" which serve as buffers for side blows.



New Type of Express Truck: In Case Any One of the Panels in the Side of the Body is Damaged, It can be Removed and Replaced with Another

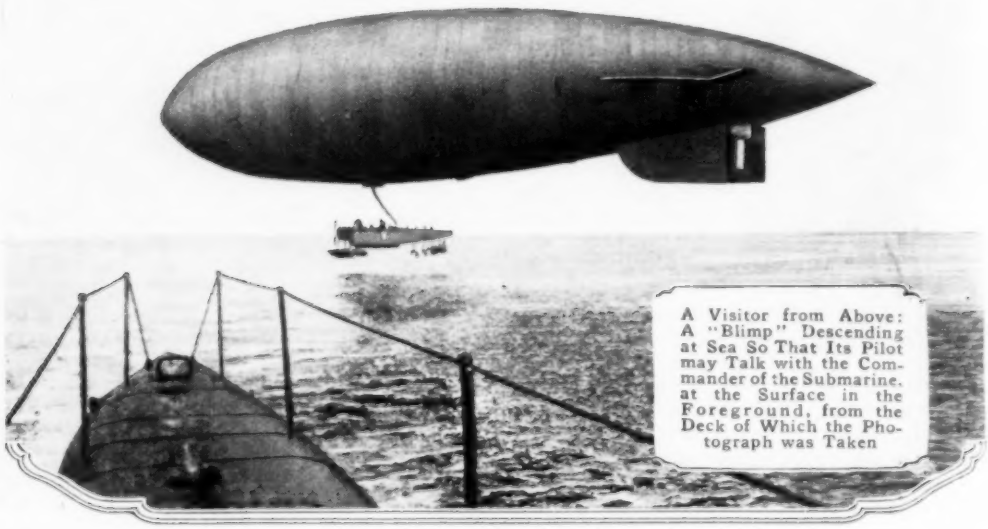
TALK THROUGH OFFICE PHONE WITH AIRMEN ALOFT

The first official demonstration of a two-way conversation between a person using an ordinary telephone line and an airman in flight was made recently in Washington. An officer on the ground talked into a desk telephone connected with a local wire, which, in turn, was connected with apparatus at a radio station. This permitted the flier in a machine fitted with suitable instruments and the man at the desk phone to converse freely. Wireless apparatus for carrying on one-way conversations has been in use for some time by aeroplane commanders and others in directing men in the air. Now, it is stated, by making the proper connections it undoubtedly will be possible for a man in New York, for example, to talk with a flying airman in San Francisco, or for two flying airmen, thousands of miles apart, to converse.



One of the Navy's Big Submarines Undergoing Repairs after Braving Heavy Seas and Ice: The Boat Is High and Dry on the Stocks, Supported by Shores. The Uprights in the Foreground Are Part of the Marine Railway

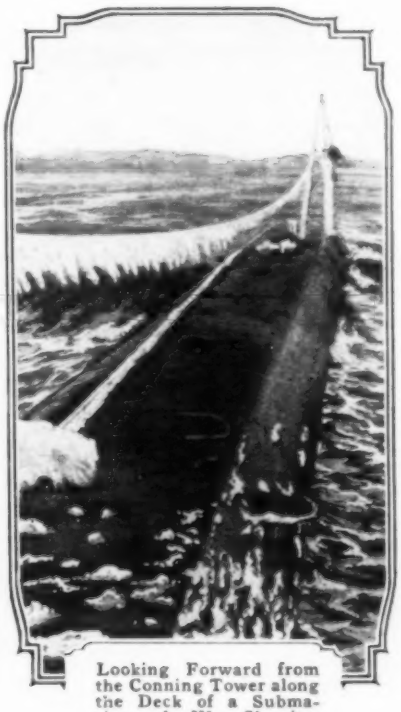
The Picture at the Side Shows the Submarine on the Marine Railway, Which Carries the Shored-Up Boat with It When Hauled Out of the Water



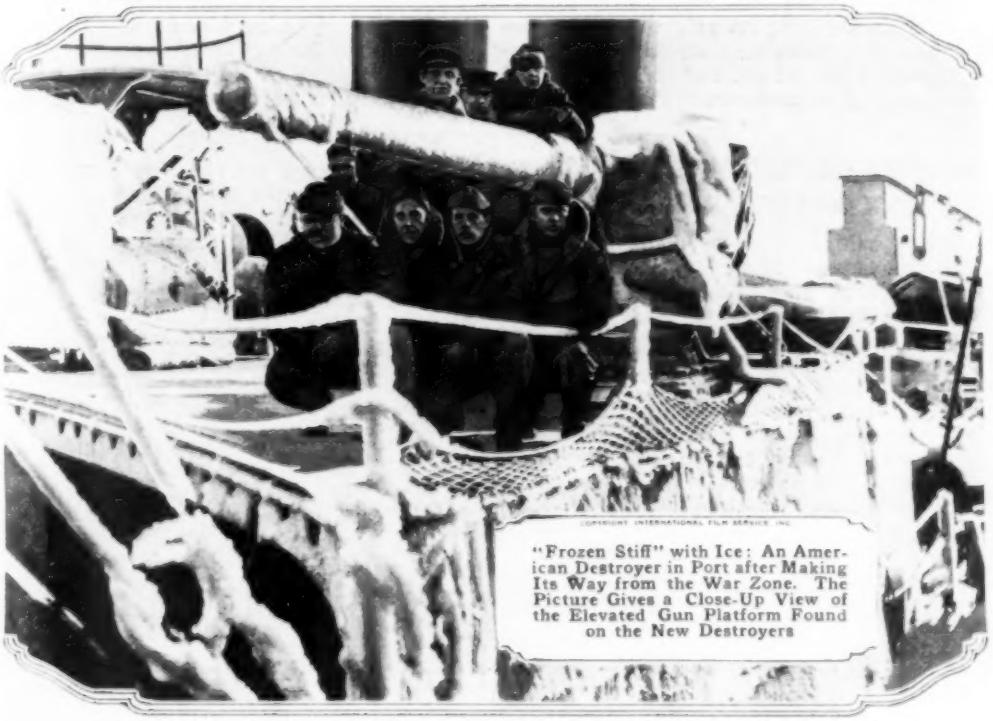
A Visitor from Above: A "Blimp" Descending at Sea So That Its Pilot may Talk with the Commander of the Submarine, at the Surface in the Foreground, from the Deck of Which the Photograph was Taken

BATTLE WINTER ICE AND STORMS AT SEA

Life aboard a Submarine at Any Time Falls Far Short of Being a Round of Pleasure, but in War Time and Wintertime and a Sea of Ice Such as This, It Means Downright Hardship



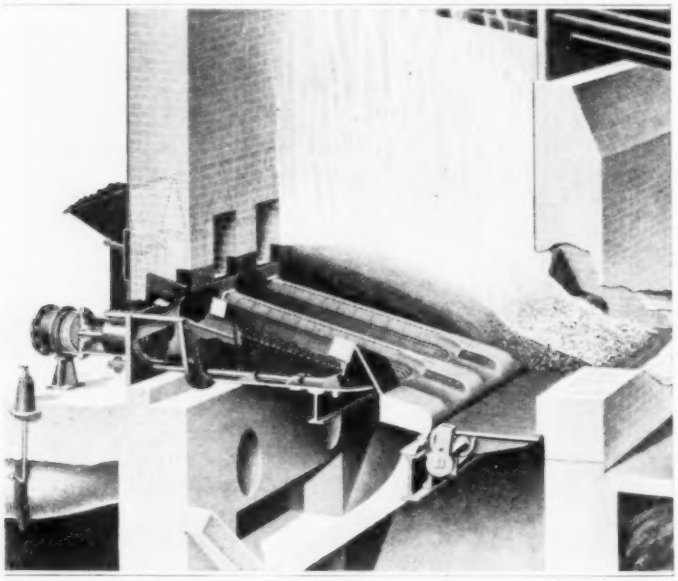
Looking Forward from the Conning Tower along the Deck of a Submarine under Way, Showing the Guide Cable Coated with Ice



"Frozen Stiff" with Ice: An American Destroyer in Port after Making Its Way from the War Zone. The Picture Gives a Close-Up View of the Elevated Gun Platform Found on the New Destroyers

AUTOMATIC STEAM-OPERATED STOKER SELF-CLEANING

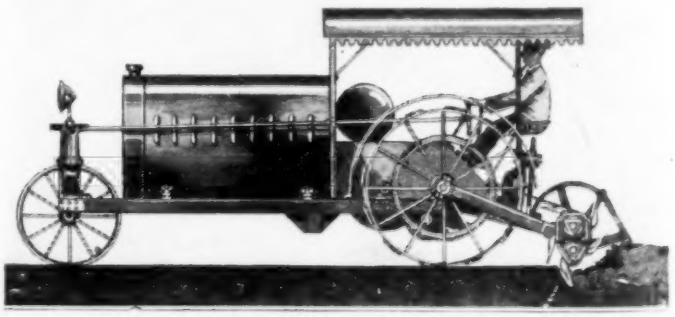
Service for more than two years under widely differing conditions is claimed to have demonstrated the efficiency of a power-operated underfeed stoker that automatically removes ash and refuse from the fire bed. A steam-actuated ram supplies the magazine intermittently with coal from a hopper installed at the front. As the coal is pushed into the magazine, which forms the support for the fuel bed, it raises the previous charge upward and rearward, underfeeding fresh coal to the fire. The latter, subjected to the intense heat from the zone of incandescence, gives up its volatile gases before igniting. Air coming from the tuyères mixes with the gases and rises through the heated fuel, while the coke that has formed is forced, by the new charge of coal, toward the top of the bed to burn with the rising gas mixture. The whole burning bed is gradually moved toward the back until, as ash and refuse, it accumulates on a balanced dump plate and is eventually dropped into a pit, or through chutes to cars. Steam automatically controls the supply of coal and air fed to the fire, a slight drop in pressure causing the delivery of fuel to be increased, and a rise in pressure having the opposite effect, so that in spite of load variations, a very uniform boiler pressure is maintained.



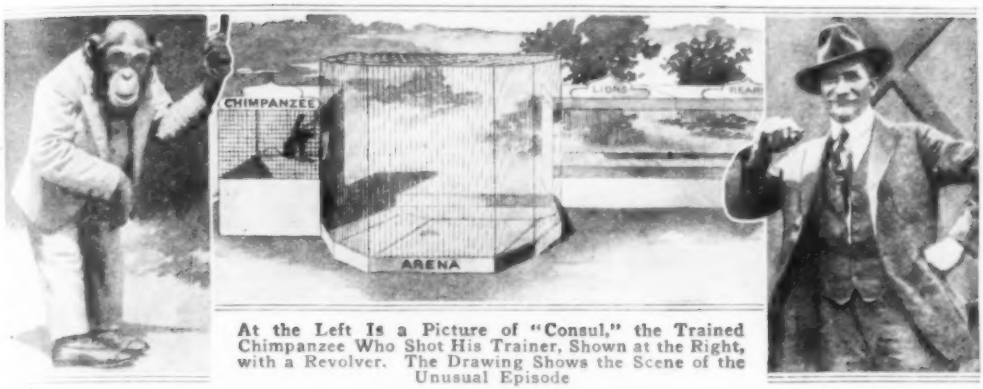
Coal Supplied from the Hopper at the Front is Pushed into the Magazine by the Steam Ram, as Shown at the Left. Gradually the Ash and Refuse is Moved onto the Balanced Dump Plate Shown at the Right

NEW FARM MACHINE PERFORMS WORK OF FOUR IMPLEMENTS

Tests, said to have been most satisfactory, have been made of a new tractor-driven farm implement which does the work of a plow, disk, harrow, and pulverizer in one operation, thereby greatly lessening the labor involved in preparing a field for planting. The special feature of the invention is an ingenious sprocket, which sends a series of spades into the ground vertically. These are staggered across the 5-ft. span of the machine just behind the drivewheels. As each spade enters the ground its thrust backward in digging up the dirt helps, to a degree, to drive the whole implement forward. The ground is disturbed to a depth of 12 in., if desired. Surface vines and weeds are chopped up and turned under.



New Engine-Driven Farm Implement Which Does the Work of a Plow, Disk, Harrow, and Pulverizer at One Operation, Spading a Path Five Feet Wide as It Moves Along



At the Left Is a Picture of "Consul," the Trained Chimpanzee Who Shot His Trainer, Shown at the Right, with a Revolver. The Drawing Shows the Scene of the Unusual Episode

CHIMPANZEE REPELS TRAINER WITH COWBOY TACTICS

Poe on the one hand and Kipling on the other have given modern literature two classic accounts of murders executed by domesticated apes. In each of these remarkable stories, the hairy brute made use of his enormous muscular strength. From an eastern city comes verified information of a near tragedy in real life, which in its way is even more striking than either of the fictional tales aforementioned.

"Consul," a trained and mannishly attired chimpanzee belonging to a troupe of performing animals, was seated in his cage in view of the arena awaiting his turn. The trainer, in putting some unruly bears through their evolutions, twice had occasion to discharge a revolver while enforcing his commands. This was observed by the ape. The firearm, instead of being returned to the trainer's pocket, was left in the arena when the bears completed their work.

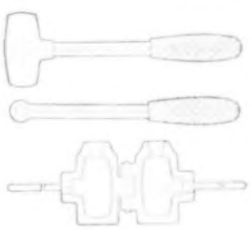
All went well with the chimpanzee and his act until he spied the revolver. Upon sighting it, however, the animal picked it up and attempted to slip it in a pocket of his clothing. He was frustrated in this by the trainer, who advanced and attempted to seize the weapon. With alacrity befitting a practiced cow puncher of early western days, the ape pointed the revolver at the man and fired. Fortunately for the latter—and perhaps for both—the cylinder was loaded with blank cartridges, and the trainer sustained nothing more serious than a powder burn. The shot may have been fired in the spirit of play, to repel resistance, or accidentally. In any case, here is an authentic instance of an anthropoid ape shooting a man with a firearm.

ITALIAN DISABLED SOLDIERS MAKE DECORATIVE DESIGNS

Interesting work by Italian wounded who have found profitable employment in designing and printing paper and fabrics for interior decoration has been cited as offering a suggestion to the Federal Board of Vocational Education, in charge of training our disabled soldiers to be self-supporting. Most of this work is not heavy and therefore particularly suited to handicapped men. Several such men now taking instruction in or near Milan have produced about 100 designs which are being used in wall paper, hangings, hat boxes, etc. All are characterized by a freshness and individuality that is most pleasing.

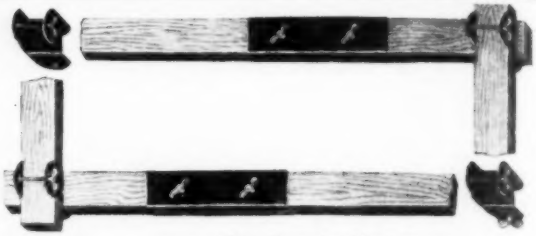
LEAD HAMMER FOR SHOP USE MADE WHENEVER NEEDED

Lead hammers, for shop use on work which would be damaged by a hard-faced hammer, are frequently made by workmen without proper equipment, resulting in loss of time. A device designed to make the process rapid and easy consists of a two-part hinged mold for the lead, and a separate handle with an eye on the end that is inserted into the mold, and an aluminum-faced grip on the other end. Different sizes of molds provide lead hammers of 1-lb., 2½-lb., and 5-lb. weight. The lead head is readily melted off in a few minutes when it becomes upset beyond usefulness, and a new and perfect head melted on.



SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

For Retaining the Covers on a Bed: A Hook at One End of a Tape Engages the Spring, and a Clamp at the Other End Grips the Bedding



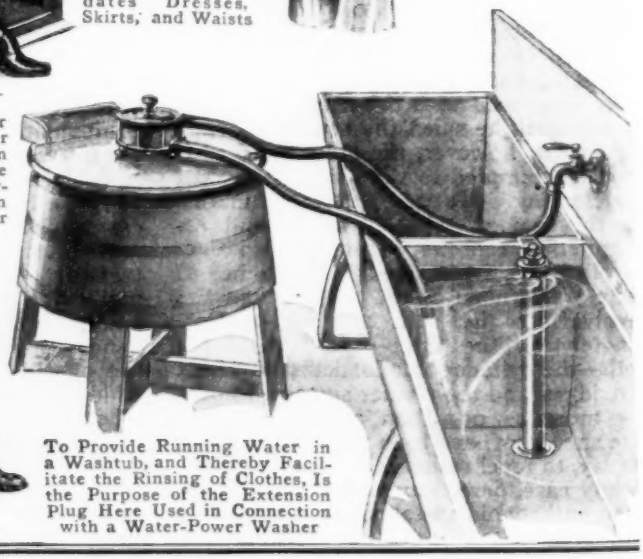
The Clamping Sleeves Shown in the Middle Take the Place of Hinges and Make This Curtain Stretcher Rigid and Nonsagging

The Spiral Spring Fitted in This Special Force Cup Keeps It in Shape and is Supposed to More Than Double Its Effectiveness and Life

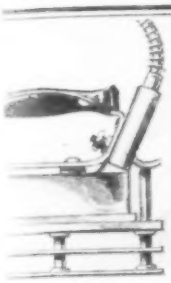
Receiving an Incandescent Lamp of Any Type, This Light-Regulating Socket Gives a Bulb a Range of 12 Different Intensities

The Two Pictures Explain the Use of a Convenient Closet-Door or Wall Rack That Accommodates Dresses, Skirts, and Waists

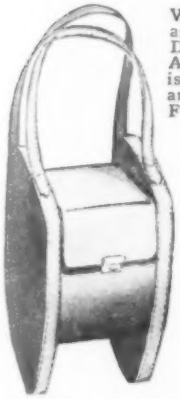
A Straight Chair with Hinged Rear Legs, Intended on Occasions to Serve as a Near-Rocker in the Manner Pictured

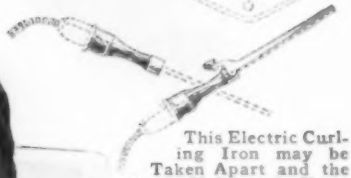


To Provide Running Water in a Washtub, and Thereby Facilitate the Rinsing of Clothes, Is the Purpose of the Extension Plug Here Used in Connection with a Water-Power Washer



While the Iron Is on the Stand, as at the Side, the Current is Disconnected. When Lifted, as Above, a Spring within the Plug is Released and Contact Formed





This Electric Curling Iron may be Taken Apart and the Shank Holding the Heating Element Screwed into a Water Bottle to Heat the Contents

A Striking Novelty for the Armistice Season: A Handbag Fashioned after the Lines of a British Tank and Richly Finished in Black or Blue Pin-Seal Leather

Supplied with Heavy Cords, This Stick with Slotted Ends Serves Conveniently as a Carrier for Small Packages and Bundles

The Newest Aid for Dish Washing: Hot Water Passes through the Soap Container at the Top and Discharges through the Brush. By Turning a Handle, Clear Water for Rinsing is Sprayed

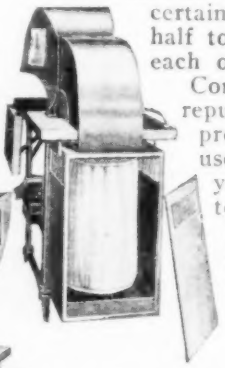
A Lasting and Serviceable Dust Mop Consisting of a Sheep's Pelt Wrapped on a Flexible Frame to Which a Handle is Attached

The Motor-Car Bed in Use Below Is a Rope-Bound and Rod-Supported Canvas Sling on Which the Seat Cushions are Placed

FUR-BEATING MACHINE HAS VACUUM FEATURE

The beating of furs to soften them and remove dust and loose hairs can now be done by a motor-driven machine instead of by hand, as is common practice, at a saving of much labor and in a most sanitary manner. The outfit is portable and does not occupy a large amount of space. The fur to be treated is placed on a padded counter which can be extended by raising leaves at either side. Above the counter is an overhanging hood having windows in its sides through which the renovation process can be observed. Turning a switch, causes three rattan sticks to rise and fall with a snappy movement much like hand-beating. The motor which drives the sticks also operates a fan, immediately above them, for drawing the dust into a bag inclosed in a chamber at the rear. By means of a controller the operator can regulate the speed of the machine to suit the fur being treated.

A New Motor-Driven Fur-Beating Machine is Shown at Work at the Left. In the Center Picture the Hood is Tipped Back, Exposing Flails and Fan to View



Rear View of Machine, with Back Removed, Showing Cloth Receptacle for Dust and Hairs

FLAX-HANDLING MACHINES AID IRISH INDUSTRY

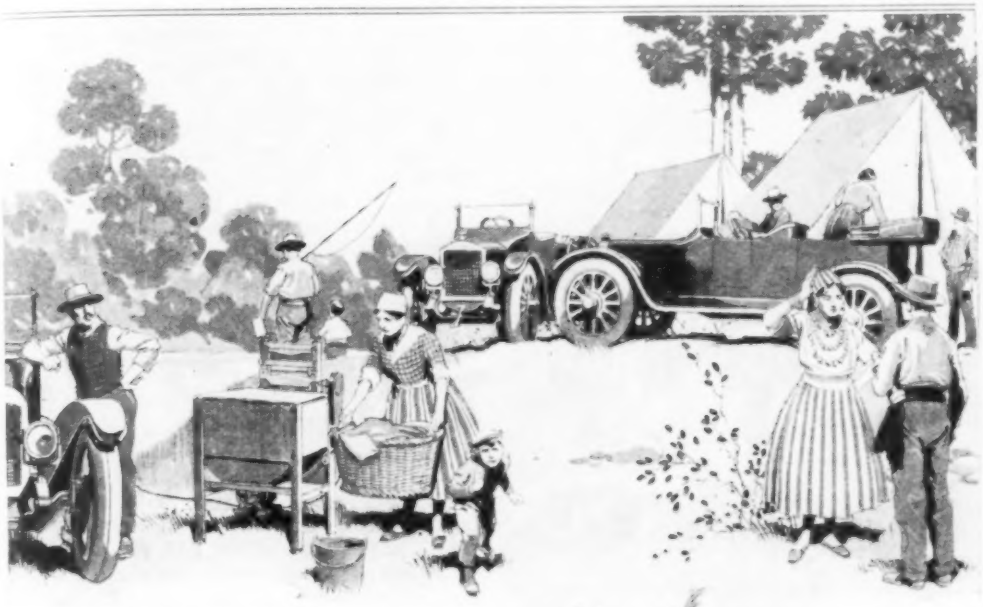
Flax manufacture, oldest of textile industries, has received new impetus in Ireland through the development of machines that perform most of the operations previously done by hand. The harvest of flax is pulled up by the roots, not cut, and simple but ingenious pulling machines are already in use. A deseeding, or rippling, machine replaces the slow hand process of removing the bolls, and delivers the stalks straightened and clean. Retting tanks, which loosen the woody core from the fiber by soaking in water until fermentation is completed, are under cover, protected from weather changes, and the flow and temperature of the water are controlled with automatic certainty. Eight to eight and a half tons of flax are handled in each of the double tanks.

Constant flow eliminates the repulsive odors of the pond process of retting, and the use only of the previous year's crop allows rippling to be done at the most desirable time. The machines for scutching, or breaking the rotted woody core away from the fiber, require the attention of skilled and experienced workers, as this is the most important part of the process. When it is completed, the cleaned flax is ready for market. Tow is made from the end not used for flax, and a meal, called "linfoo," is produced by grinding the seed shell, leaving no waste whatever. It is anticipated that the improvements will popularize flax growing by increasing the marketability of the crop.

BIBLE REFERENCE IN CARS PROMOTES TRUTHFULNESS

Placards containing the words "Proverbs XII:19" and "Tell the Truth" have been displayed on the front of all local cars of the Philadelphia Rapid Transit Company as a feature of a "truthfulness" campaign. The company has been blamed for numerous accidents alleged to be the result of the skip-stop plan, but investigation has shown that the testimony of many witnesses could not be substantiated, or was false. Of late, testimony has proven more reliable, it is said, and the placards are given much credit therefor. The verse in Proverbs reads: "The lip of truth shall be established forever; but a lying tongue is but for a moment."

AUTO-RIDING GYPSIES USE UP-TO-DATE APPLIANCES



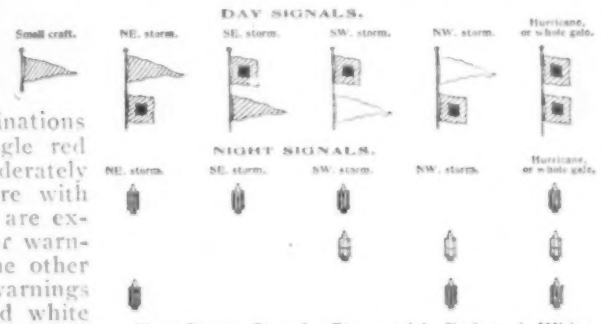
A Gypsy Camp in Which Automobiles have Supplanted the Old-Fashioned Horse-Drawn Wagons, While an Electric Washing Machine is Numbered among the Labor-Saving Appliances Which These Picturesque Nomads have Adopted

The use of automobiles by gypsy bands, which has already attracted not a little public notice, appears to have been but the first step in modernizing the whole life of these picturesque nomads. Recent reports from a gypsy camp in Indiana tell of the use of appliances there

such as are found only in up-to-date homes. An electric washing machine, run by power generated by one of the band's automobiles, is perhaps the most conspicuous innovation. When the wanderers are on the move the machine is securely strapped to one of the cars. It is said heat and cold-retaining bottles are among the kitchen utensils.

NEW STORM SIGNALS ON GULF AND ATLANTIC COASTS

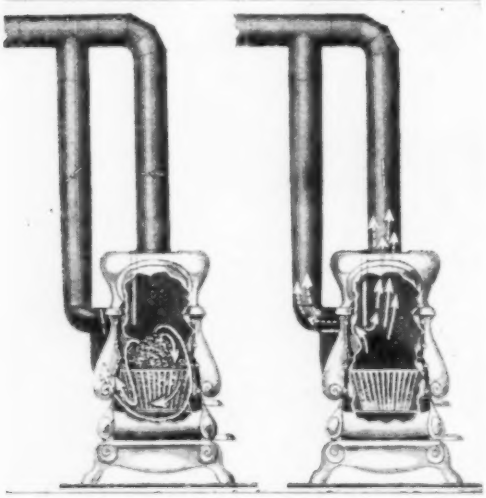
A new system of storm warnings for vessels was put into effect on the Atlantic and Gulf coasts the first of the year. As the accompanying illustration shows, the day signals are given with red and white pennants, and square red flags, having black centers, used in the combinations indicated. The display of a single red pennant alone indicates that moderately strong winds which will interfere with the safe operation of small craft are expected. No provision is made for warning small craft at night. For the other storm signals, however, night warnings are given by the use of red and white lanterns. These warnings have been in use on the Great Lakes for more than two years, and, eventually, they are to be introduced on the Pacific coast also.



New Storm Signals Given with Red and White Banners by Day, and Red and White Lanterns by Night

DEVICE ADAPTS BASE BURNERS TO USE OF SOFT COAL

The government's restrictions on hard coal have caused the Fuel Administration to recommend the use of a simple attachment for hard-coal base burners which makes them capable of burning soft coal satisfactorily. The magazine in the top of the stove is removed and a special lid is substituted for the old one. Extending downward from the new lid to the fire pot is a 1¼-in. air-supply pipe, while an auxiliary stovepipe is provided which extends upward from a large hole in the lid and connects near the ceiling with the regular pipe. The dampers in the auxiliary pipe and the air-supply pipe are left open about 15 minutes after putting on fresh coal so that the smoke is disposed of rapidly. During this period, when the coal is coking, the auxiliary pipe radiates considerable heat. The smoke being consumed, the dampers are set to force the draft down through the fuel and the air-supply pipe partly closed.



Hard-Coal Base Burner, Minus Magazine, Provided with an Attachment for Burning Soft Coal: Left-Hand View Indicates How Dampers are Set After Coal has Coked. That at Right Shows Arrangement of Dampers during Coking Period

AID FOR FRENCH SOLDIERS WHO BECOME FARMERS

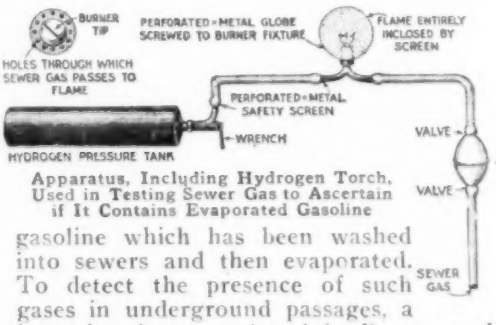
The department of Loire, in central France, has felt so keenly the need of developing its agricultural interests that it is offering remarkable inducements to soldiers to take up land. The sum of $120,000 has been voted to promote the work. A minimum of 20 to 25 acres may be allotted to men, mobilized or not mobilized, who comply with certain conditions, one of which is that they remain as the heads of their farms for 10 years. Furthermore the department offers free to each man $200 worth of modern farm machinery and will loan him, over and above this, $100 worth of implements for each 25 acres tilled in addition to the first 25 acres. Fifteen years are allowed to pay back the latter obligation. To encourage larger families, part of the loan can be canceled according to the number of children born on the farm.

OFFER PRIZE FOR INVENTION OF AEROPLANE PARACHUTE

The sum of $500 has been offered to the Aero Club of America to be used in promoting the invention of parachutes for fliers. A committee has been appointed by the club which will arrange for a competition. Men familiar with the problems of flying point out that a safety device of the character sought, if it is to be of practical value, must be so constructed and so attached that it can be utilized at any instant regardless of the position of the aeroplane and flier. While a variety of parachutes were in use during the war, their relative merits have not yet been fully determined. Valuable suggestions are expected from this contest.

LAMP DETECTS GASOLINE FUMES IN SEWERS

The growing number of garages has increased the danger of explosions from gasoline which has been washed into sewers and then evaporated. To detect the presence of such gases in underground passages, a lamp has been employed in Boston and elsewhere, which is similar in principle to a safety lamp. It burns hydrogen, a pressure tank being provided for the gas while placed over the burner is a brass globe having 324 perforations per square

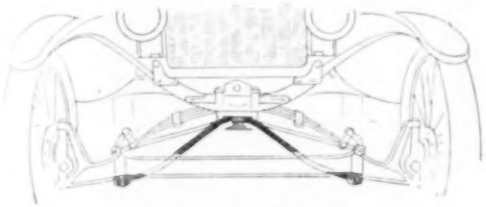


Apparatus, Including Hydrogen Torch, Used in Testing Sewer Gas to Ascertain if It Contains Evaporated Gasoline

inch. Around the burner is a collar through which vapor from a sewer can be forced up into the flame by means of a suction tube attached just below the lamp and provided with a suitable bulb. To test a sewer this tube is lowered to the surface of the flowing sewage and the bulb is operated by hand. If any gasoline vapor is present, the flame, which normally is almost invisible, will take on a greenish or bluish cast.

AUXILIARY FRONT RADIUS ROD HOLDS AXLE IN ALINEMENT

Broad claims of merit are made for an adjustable radius-rod support that has been fashioned for a certain type of light car. The device is intended to keep the front axle of the machine in proper alinement and relieve driving strains. While it is sufficiently strong to prevent an axle from "crawling" back, and a radius rod from being broken thereby, it has enough resiliency to take up the shock in the event of a head-on collision and safeguard the



Showing the Adjustable Radius-Rod Support in Place, Bracing the Front Axle in a Way to Prevent Back "Crawling"

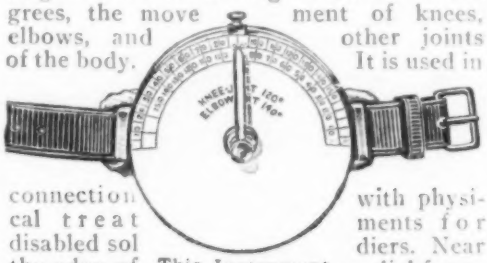
crank case from injury. Attachment of the support is a simple matter, requiring only a few minutes of labor.

OVERSTOCK OF RATION CANS USED TO SHIP CEREALS

Immense tin cans, with a capacity of 100 lb. of food, were used by the War Department for packing trench rations. The armistice left the Subsistence Division with 150,000 of these special containers on its hands—and they cost $1.50 apiece. No use for them was apparent, and they usurped an enormous amount of storage space. Just at this serio-comic crisis, the government received an overseas order for 10,000,000 lb. of oatmeal and hominy. Cereals for salt-water shipment have to be packed in hermetically sealed containers. The problem of the unemployed trench cans was solved, and the cost of new containers was saved.

INSTRUMENT MEASURES EXTENT OF MOVEMENTS OF JOINTS

An instrument has been devised in England for measuring in terms of degrees, the movement of knees, elbows, and other joints of the body. It is used in connection with physical treatments for disabled soldiers. Near the edge of a dial forming the face of the instrument are two parallel sets of graduations, numbered in opposite directions and showing angles up to 150°. Straps are provided for adjusting the device to the limb to be tested and the movement of the latter is shown by an indicator on the dial.



This Instrument, Attached to Arm or Leg, Records Movement of the Joints

CHARGES AND SERVES DRINK AT ONE OPERATION

Beverage carbonator, storage tank, cooler, dispensing faucets, and counter for glasses are combined in a device intended for use where the serving of soft drinks is a side line, or for transient entertainments. It needs no operating power, using the carbonic-gas tank of commerce to supply pressure for dispensing the drink as well as charging it. So long as the gas and beverage supply lasts, the dispensing pressure is automatically maintained at the same moderate point, regardless of the tank content. Lack of excess pressure eliminates the usual spluttering escape of gas from the faucet.

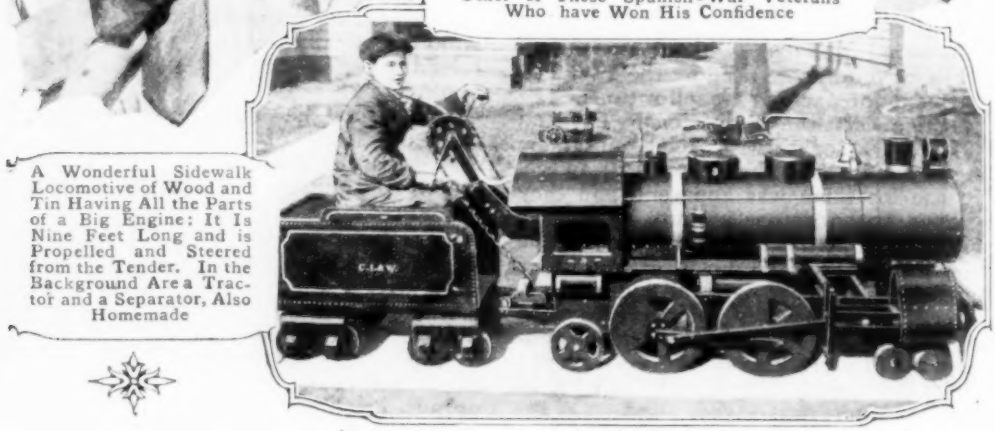
¶ According to estimates of the Geological Survey, the quantity of petroleum marketed from oil wells and field-storage tanks in this country in 1918 amounted to 345,500,000 bbl., an apparent gain of three per cent over the former record output, established the previous year.

BOYS AND GIRLS AMID NOVEL SURROUNDINGS

PHOTO BY AMERICAN PHOTO SERVICE

What Boy has Not Dreamed of the Sea, and Life in the Navy? Here Are Some Lucky Youngsters, Guests on the Great Battleship "New York," Who were Shown All About That Floating Fort. One of the Officers in Charge Let Them Handle the Mechanism of a Gun and Look through the Sights

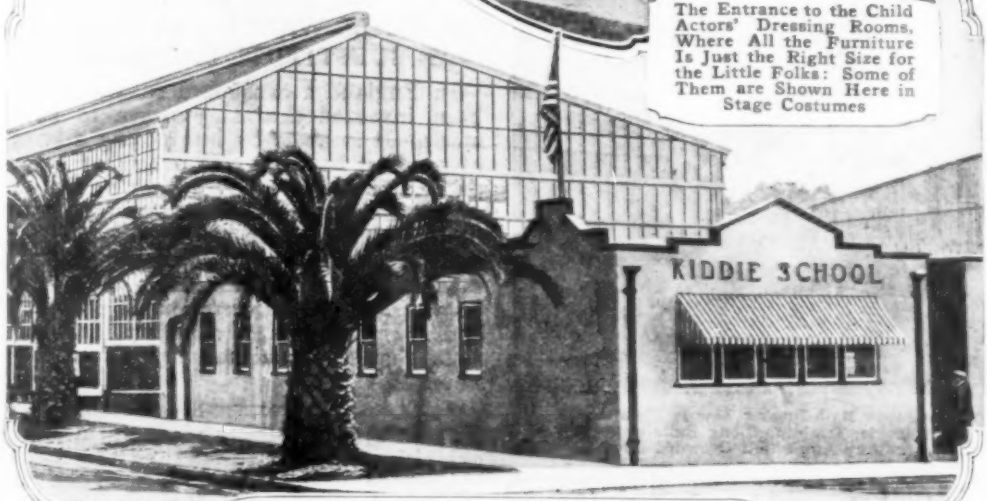
Having Dinner from a Medicine Dropper! Dick Is a Humming Bird Who Comes Daily to the Yard of the National Soldiers' Home near Los Angeles and Dines, as You See, Sitting on the Finger of One or the Other of These Spanish-War Veterans Who have Won His Confidence



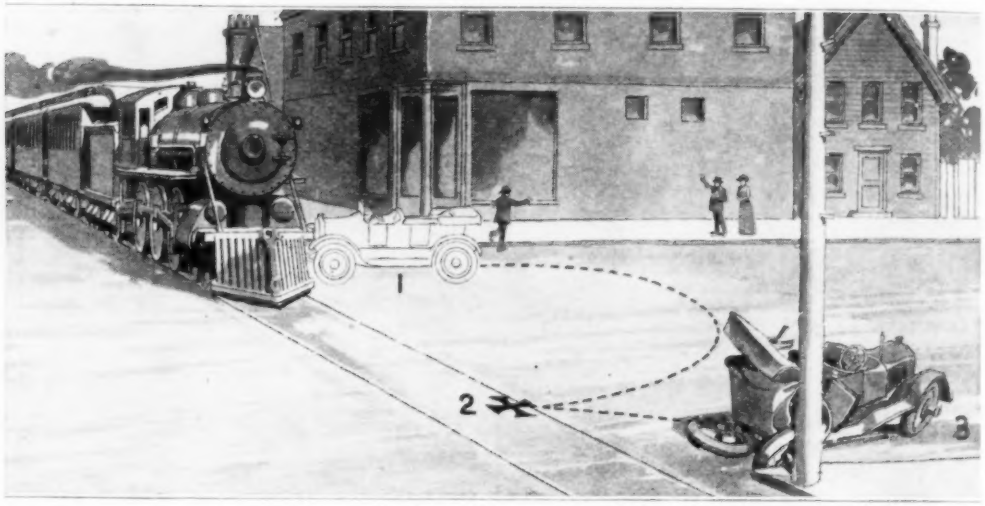
A Wonderful Sidewalk Locomotive of Wood and Tin Having All the Parts of a Big Engine: It Is Nine Feet Long and is Propelled and Steered from the Tender. In the Background Are a Tractor and a Separator, Also Homemade

Perhaps in No Other School in the World can One See Such Strange Sights as Here, with Pupils in All Sorts of Costumes. But That Is Because They Act for the Movies in the Studio Close By and Have to Be Ready at a Moment's Notice. No Doubt They don't Mind a Bit

The Entrance to the Child Actors' Dressing Rooms, Where All the Furniture Is Just the Right Size for the Little Folks: Some of Them are Shown Here in Stage Costumes



Exterior View of the School Where Several of the Children Whom One Sees in the Movies Learn Their Lessons, Aided by Three Teachers: The Grown-Up Actors Try, as Far as Possible, to Call on Their Little Helpers Only after School Hours

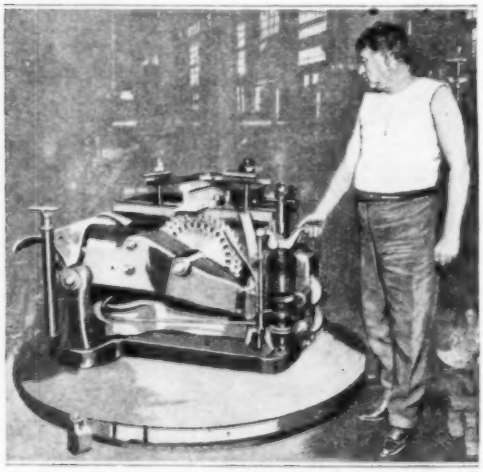


LOOSE BRAKES SEND AUTOMOBILE TO JUNK PILE

WHEN the brakes failed to work and a motor car collided with the slow-moving engine of a passenger train at a grade crossing in a western town some days ago, a scrap heap of broken parts and twisted metal was quickly established. The radiator of the automobile struck the cylinder on the left side of the locomotive. The impact knocked the machine in a semicircular course that terminated on the railway track and resulted in a second collision. The latter was a businesslike one, and the car was hurled against an adjacent telephone pole, thereupon ending its career.

RAIL CUTTER ON TURNTABLE FOR CROWDED SHOP

Feeding long railroad rails at various angles to a cutting machine in a crowded



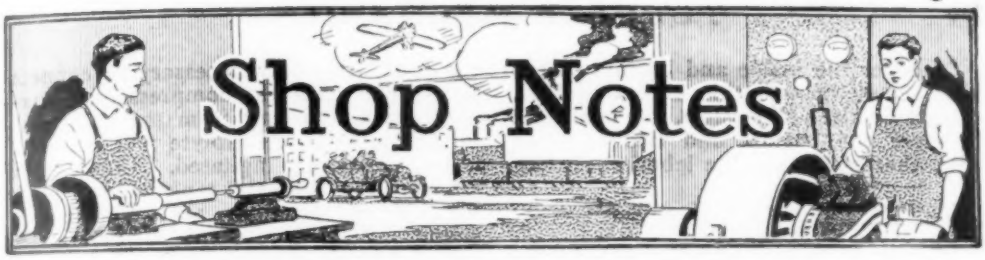
This Heavy Rail-Cutting Saw is Mounted on a Turntable, Enabling Long Rails to be Cut at Any Angle in a Crowded Shop

shop was an exasperating problem until the happy thought occurred of mounting the cutting machine on a turntable. The saw used for this work naturally has a very heavy carriage and demands a rigid mounting. These difficulties, however, were successfully overcome, and the turntable was so arranged that it can be rotated to any position and firmly locked. This enables the long and awkward rails to be handled from any point in the shop and sawed off by turning the cutter to the desired angle.

SAWMILL WASTE MAY BE USED IN SUBSTITUTE CARDBOARD

In England a cardboard substitute has been invented that may prove to have merit. It is made by interposing a layer of sawdust between two sheets of paper and binding the whole together by the use of adhesive material and pressure. Any desired thickness or weight may be obtained by using several alternate layers of sawdust and paper in building the board. In view of the universal paper shortage and the cheapness of sawdust, it is possible that the scheme may prove economical.

¶ Plans are now being made for a large exhibition of Norwegian and American mercantile products to be held in the fall of the present year in Norway, the purpose being to strengthen business relations between the two countries represented.



Electroplating Outfit for the Small Shop

By KENNETH M. COGGESHALL

MOST of the small metal parts on an automobile body, as well as some parts of the mechanism, have either a brass or nickel finish. It is, therefore, most important that the modern automobile-repair shop include, among its equipment, an electroplating outfit suitable for refinishing these small parts. It is not necessary that such an outfit be elaborate, but it must be adequate; good results cannot be obtained with makeshift apparatus.

The first essential is a suitable plating tank. For the average work, this should be approximately 3 ft. high, 3 ft. wide, and 4 ft. long. It should be made of 2-in. boards, 8 in. or 10 in. wide. Use as few nails or screws in its construction as possible, since the fumes from the plating solution will corrode them. The end boards are here cut 3 ft. 2 in. long, and a sufficient number of them laid side by side, as in Fig. 1, to make the total height of the end piece 3 ft. 6 in. In like manner, the bottom piece is constructed, the

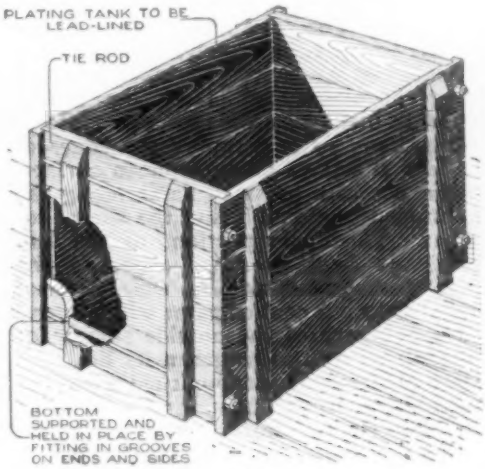
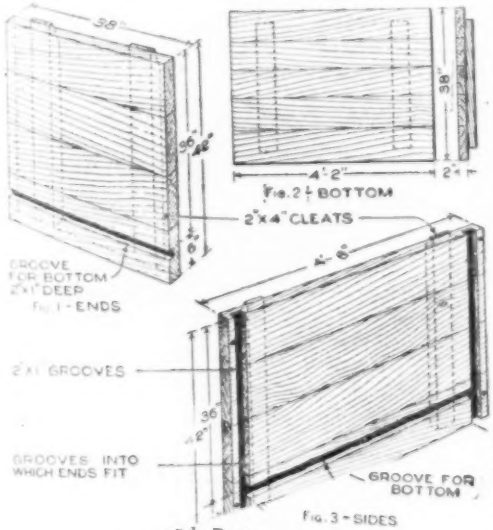


Fig. 4

The Tank is Fastened Together by Steel Tie-Rods Which Are Not in Direct Contact with the Plating Solution



and Bottom of the Tank are Each Other and Joined with Metal The ... enings to Provide Greater Strength

dimensions being given in Fig. 2. Fig. 3 shows the dimensions of the sideboards to be 3 ft. 6 in. by 4 ft. 6 in. A groove, 1 in. deep and of the same width as the thickness of the material used, is cut 6 in. from the lower edge and the full length of the end pieces, as designated in Fig. 1. It will be necessary to cut three grooves in the sides, as may be seen in Fig. 3. A 3/8-in. hole is bored in the end of each side, 4 in. from the upper edge; a similar hole is bored 3 in. from the lower edge. The tank, when assembled, will appear as in Fig. 4. The bottom is supported by the grooves in the lower part of the ends, while the ends themselves fit into the grooves cut in the sides. Steel rods, 3/8 in. in diameter and threaded at the ends, are passed through the holes from one side to the other. Steel washers are placed next to the wood, and nuts screwed on, thus holding all pieces tightly in place.

To cover the inside and bottom of the tank, secure several thin sheets of lead, of suitable size; if possible, use one sheet to cover the bottom and two opposite sides, thereby saving the labor of closing

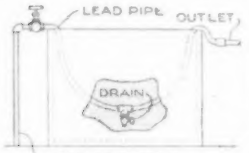


Fig. 5

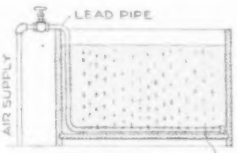


Fig. 6

The Electrolyte is Heated by Steam in a U-Shaped Pipe and is Kept Agitated by Bubbles of Compressed Air

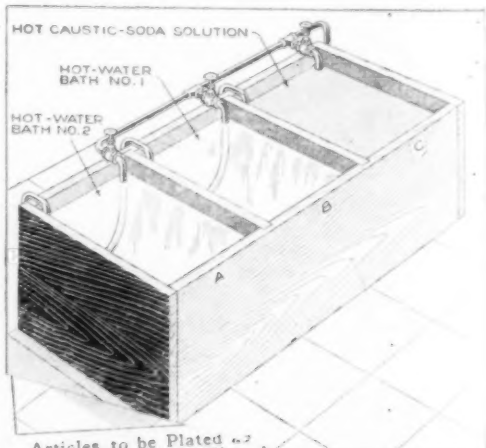
two joints. The remaining sides will have to be covered separately, these sheets overlapping the first by 1 in. Following along the overlapped places, tap with a mallet to make sure the pieces lie close to each other. After scraping the edges of the lead sheets to obtain a clean surface, pass a hot iron or small flame along the overlapped sections, fusing the sheets together. The upper portions of the lead sheets are bent over the edges of the tank, thus protecting the wood against acid attacks. A coat of paint will improve the appearance of the outside surface of the tank, as well as lengthen its life.

Better plating is accomplished when the solution is warm. The best plan for heating the electrolyte is to pass steam through a coil placed in the tank. A steam connection is available in most shops of average size, and it therefore only remains to install the heating coil. For a tank of the size here described, 8 ft. of ¾-in. lead pipe, formed into a large "U," as in Fig. 5, and mounted inside the tank, is all that is necessary. A valve placed at the intake for the regulation of the steam flow, and an outlet for the other end of the coil, will be required. A drain cock should be placed at the bottom of the "U," so the pipe may be drained when the tank is being cleaned. Heating the solution by steam is not necessary during the summer months, but in cold weather it is most essential.

The method of agitating the electrolyte is quite simple. As shown in Fig. 6, 8 ft. of ¾-in. lead pipe is passed over the upper edge of the tank and down to the bottom, where it is laid the full length of the tank. Previous to laying the pipe, that portion which will lie in the botom of the tank should have a number of very small holes drilled in it. The bottom end of the pipe is closed with a cap. After the pipe is in place and the solution in the tank, it is only necessary to connect the former with the compressed-air supply; the air passing from the holes and up through the electrolyte will keep the latter constantly agitated. Compressed air from the "free-air" tank will be handy for this purpose in automobile-repair shops. While agitation of the solution is not absolutely necessary, it will improve the quality of the plating.

For the source of electrical energy for plating, it is best to secure a generator designed for this particular work. Direct current of large amperage is required, under a low pressure, usually about six volts. The generator may be driven by a gasoline engine, or an electric motor connected to the service lines. The generating outfit should be situated near the plating room, so that the voltage drop in the feed wires will be small. A rheostat connected in the field of the generator will allow the operator to regulate the plating current to the necessary value.

For nickelplating, the electrolyte is prepared in the proportion of ¾ lb. nickel ammonium sulphate to 1 gal. of water, with a very small amount of boric acid added. A good solution for copperplating may be made by dissolving in each gallon of water used 10 oz. of potassium cyanide (which is a deadly poison), 5 oz. of copper carbonate, and 2 oz. of potassium carbonate. Brassplating may be accomplished by adding zinc carbonate; a good yellow brass color results from a solution of two parts copper to one of zinc. A strong electric current will deposit a greater amount of zinc, thus producing a lighter color. In each



Articles to be Plated a... Solution and Then Ri... ...ned in an Alka... Water

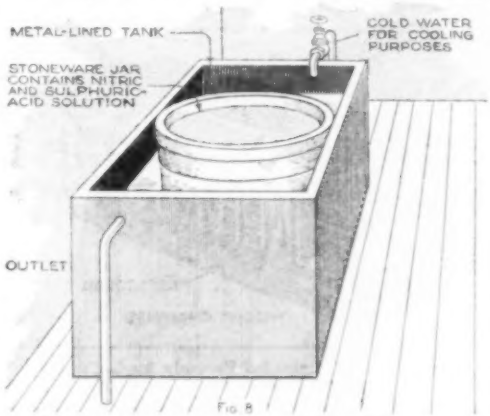
the proper anodes, or blocks of me-

to be deposited, must be provided; a copper anode, for instance, for copper-plating. The anode is connected to the positive wire from the generator, while the object to be plated is connected to the negative line. A convenient method of connection is to place copper bars across the tank, insulating them from the lead sheeting by wooden strips. If three bars are available, the two outside ones, near the ends of the tank, should be connected to the positive terminal of the generator, and the metal anodes suspended in the solution from them by copper wires. The central bar should be connected to the negative line and the objects to be plated supported in the electrolyte by wires connected to it.

Before a piece is put in the plating bath, it must be chemically clean. It is not sufficient to remove the grease or tarnish by mechanical means; the part must be dipped in a hot chemical solution. It must not be touched with the fingers after dipping prior to plating if perfect work is desired, since the smallest trace of oil will spoil the plating surface. Aside from the preparation of the metal parts for plating, this "bright dipping" may sometimes be used alone to restore the original luster to tarnished parts. Metal parts, especially brass, that have been cleaned and brightened by dipping, and then coated with a clear lacquer, will hold their luster for months under favorable weather conditions.

The only equipment necessary for dipping work is three tanks, or one tank with three compartments, as in Fig. 7. These tanks are built of wood and lined with sheet lead to prevent leaking. A heating coil similar to that used for the plating tank, Fig. 5, should be installed in each compartment. Tanks A and B, Fig. 7, are filled with water kept hot by the steam coils. Tank C is filled with a solution of 1 lb. of caustic soda to each gallon of water used. The solution may be retained indefinitely by merely adding caustic soda from time to time to keep up its strength. The water in the rinsing tanks A and B must, of course, be changed occasionally, and it may be found best, if the amount of dipping warrants it, to equip them with overflow pipes and allow fresh water to flow into them from an outside water connection. Pieces to be dipped are held for a moment in solution C, then rinsed in B, and finally in A. To dry the pieces, put them in a box of sawdust; the latter will quickly absorb the moisture.

For most shopwork, the caustic-soda solution will suffice, but for a better quality of work, it is well to use an acid bath in conjunction with it. A large earthen-



An Acid Bath before Plating, in Addition to the Caustic-Soda Dipping, Improves the Quality of the Plating

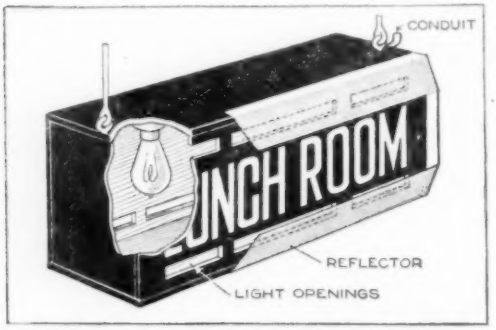
ware jar, placed in a tank of cold water, as in Fig. 8, will hold the solution. The acid should be prepared in the following proportion and order: one part water, four parts nitric acid, and six parts sulphuric acid. This bath is particularly helpful in cleaning cast-iron, steel, and aluminum parts. In each instance it is best to dip the metal first in the caustic-soda solution, then in the acid bath, and rinse thoroughly before plating.

Removing Plant Growth from Stone

Almost all stonework outdoors becomes badly marked with plant growth after a while. This vegetation is composed of minute organisms that cannot be seen at all, except when they are present in large numbers. To get rid of these, proceed in the following manner: Scrape the stone well with an old knife, removing the dirt as far as possible in this way. Still, there will be much remaining that cannot be reached. Prepare a one-per-cent solution of carbolic acid and water. Wash the surface of the stone with this, and leave it wet for a few hours. Then, by scrubbing with a stiff brush, it is easy to get away every tiny plant. To prevent the return of vegetation, and also to improve the appearance of the stone, treatment with salt is strongly recommended. Mix up a strong solution of salt and water and use this for washing the stone. It will bleach the stone, and, when the latter is dry, it glistens attractively.

Light Illuminates Sign by Transmission and Reflection

An electric sign with transparent letters is very costly. A flood-light effect is

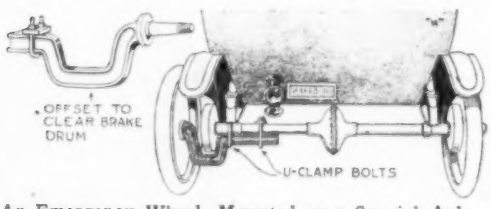


A Sign That is Illuminated Entirely by Light Reflected from the Inside can be Made in the Home Workshop

as efficient, and it is easier to produce a sign lighted in this way in the home workshop. A box is made for the sign, considerably larger than the lettering calls for, and deep enough to house the lights. Around the edges of the box, on the face side, long narrow slits are cut. The inside of the box is painted white, and the outside black with white letters. Around the edges of the box, strips of tin are nailed, and bent at right angles to the face of the sign. The inside of these strips are painted white, and the outside black. Lamp sockets and lamps are installed in the box, and the sign hung in place and wired. When the current is turned on, the lettering will be illuminated by light reflected through the slits, to the tin, and then upon the face of the sign.

Emergency Wheel for Disabled Automobiles

For the garageman who encounters road jobs that necessitate towing in a car with a broken wheel or axle, an emer-



An Emergency Wheel, Mounted on a Special Axle, can be Readily Attached to the Disabled Car

gency wheel, such as is used by one suburban repair shop, is not only adaptable to most any kind of car, electric, gasoline, or steam, but is quickly made up of discarded materials with but little work.

The wheel is of the regular automobile type with a 34 by 4-in. pneumatic tire, this size being suitable for use on both large and small cars. The axle is either a broken front axle or a short section of a strong steel beam. The emergency axle is bent or dropped, the offset being necessary to clear the axle-housing flange or brake drum. The device is attached by means of two U-shaped clamps and nuts. The sketch shows the general appearance and manner of attaching the emergency wheel to the rear axle of a car, but it may also be used in front, as the clamps are easily shifted.

Test Taper for Ammonia Leaks

The following method for making a sulphur taper to use in testing for ammonia leaks is very convenient. Melt a small quantity of sulphur in a shallow pan (the lid of a baking-powder box will do) and, with a notched stick, hold a heavy cord down into the pan, and draw it through, thus coating the cord with melted sulphur. This should be kept very hot, otherwise it thickens and coats the cord heavily, causing too much of a flame when the taper is used. Wind the dipped cord on a piece of cardboard, about 6 in. long, being careful not to break the sulphur coating. This cord, when cut at the turns, forms sticks of convenient length to hold while using. To test for ammonia leaks, light a sulphur taper and hold the flame near the suspected place. Whenever there is a leak, a dense white smoke will appear; even a leak too small to give off an odor will cause a smoke.—F. H. Sweet, Waynesboro, Va.

Soapstone Extinguishes Gasoline Fire

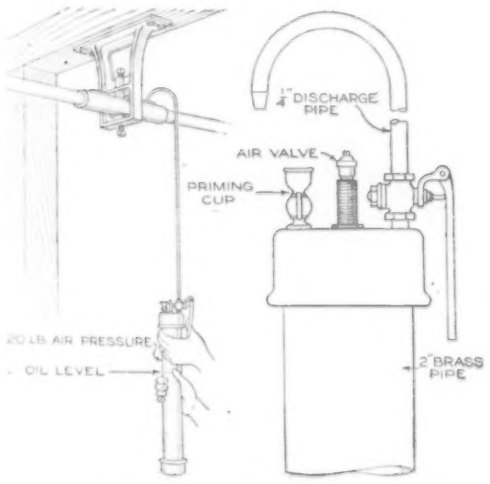
A gasoline fire in a vulcanizing plant, which might otherwise have become disastrous, was quickly extinguished by one of the workmen. He seized a sack containing four or five pounds of soapstone, and sifted it heavily over the rubber tire

which was being washed with the gasoline when it caught fire. By this means, the flames were soon smothered.—Claude O. Soats, North Salem, Ind.

Oiling Overhead Shafts without a Ladder

A homemade contrivance has been used with considerable success in oiling the shaft bearings of a large shop. It saves time and does away with the trouble of carrying, or moving about, a long ladder, and eliminates the danger of the workman falling off a ladder or getting caught in the overhead pulleys.

The main cylinder of the device is made of a length of 2-in. pipe, and two pipe caps. Brass makes the lightest and best-appearing tool, but iron is as good otherwise. There is a charging cock, such as a priming cup, a spring-closing discharge valve, and an air valve connected to the top cap. A long piece of ¼-in. pipe, one end of which is bent to the form shown, is used to convey the oil to the shaft bearing. This tube must reach nearly to the bottom of the cylinder. This is the operation: The cylinder is filled two-thirds full of oil, and then the shop compressed-air line is used to charge the remaining volume of the cylinder to 20-lb. pressure. By pressing gently on the spring cock, the oil is forced up the pipe to fill the bearing cup or trough. After a little practice, the



A Specially Constructed Shaft Oiler Which Forces Oil into the Bearings by Air Pressure, Saving Time in a Large Shop

work of oiling with quickness and precision is learned.—C. H. Willey, Concord, New Hampshire.

Hose Attachment Permits Slow Irrigation

Irrigating a garden slowly and continuously has been found the most effective way, but to get the water to run properly has been difficult. A simple change in the hose coupling makes the work easy. Usually the gasket soon wears out and becomes

A Copper Washer between Rubber Gaskets in a Hose Coupling Provides a Steady Stream for Garden Irrigation

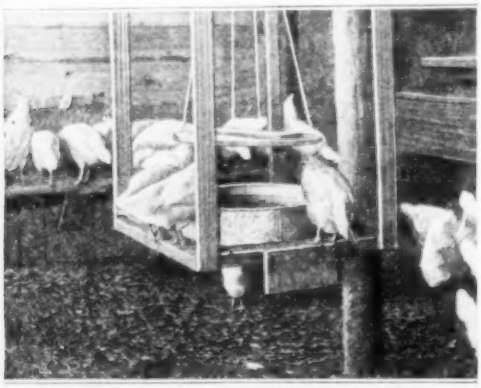
leaky, and thus the water pressure varies. The attachment will prevent this trouble. It consists merely of a thick copper washer with a 1/16-in. hole, and two ordinary rubber washers, one to be fitted over and one under the copper washer in the coupling. When the hose is attached to the hydrant, with the joint screwed tight, the rubber washers prevent leakage and hold the copper washer in place. The faucet may then be fully opened, without throwing the pressure into the hose.

The water is distributed under low pressure by means of a piece, 10 ft. long or more, of ⅜-in. pipe, pierced every 24 in. with a 1/16-in. hole. The pipe is fitted at one end with a reducer and coupling to fit the hose, and is capped solid at the other. The streams that come from the pipe are uniform at all the holes, and not of sufficient strength to cause erosion of the soil. The pipe may easily be moved while the water is running.

It is possible to use this irrigator in many ways. After transplanting, place the pipe between the rows, and let the water run until the ground is thoroughly soaked. During a dry spell, use the pipe between the rows, and also around the patch, at both the sides and ends of the rows. This should be done only after the heat of the day, however. It will keep the plants from wilting the following day. —John L. Von Blon, Los Angeles, Calif.

Poultry Drinking-Water Protector

With poultry raising becoming ever more important, the aids to profitable production are attracting increased attention. One of the difficulties in the past has been that of providing a clean and dependable water supply in the poultry houses, common pans being quickly overturned, and special water jars befouled with litter by the scratching hens. With the protection here illustrated, there can be no overturning or soiling of the water. The receptacle is a galvanized pan suspended from the ceiling by means of four sticks, making a sort of shelf at an easy jumping distance from the floor. The hens stand on the shelf to drink, and are prevented from dabbling with or soiling the water by a circular board suspended above the pan, which interferes with the hen alighting on the pan edge, but does not hinder her drinking. Thus, at all times, the water supply is clean and cannot be overturned.—Alvah H. Pulver, Sodus, N. Y.



Poultry can Neither Scratch Dirt into the Protected Drinking Water Nor Tip the Pan Over

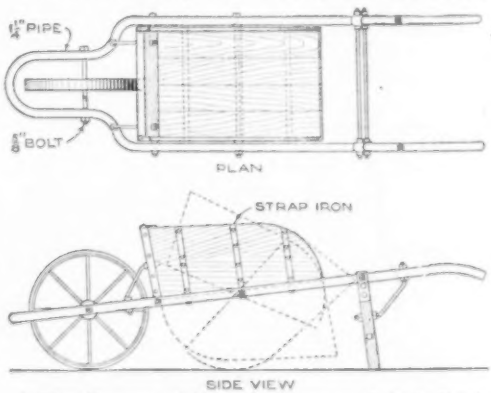
Ink Made from Old Indelible-Pencil Stubs

An excellent grade of indelible rubber-stamp ink is obtainable without cost by collecting the stubs of indelible pencils that accumulate about the office, splitting them, and dissolving the leads in water, in an ordinary ink bottle. The thickness of the ink, or the density of the deep-purple color, depends on the amount of lead in proportion to the water in which it is dissolved. For inking pads and rubber stamps of the self-inking type, the ink produced in this manner should be fairly thick—about the consistency of average coffee cream. For use in brushes for addressing packages, freight shipments, etc., the ink must be slightly thinner. By thinning to the desired degree, a splendid indelible writing fluid may be had for use in pens.

In view of the fact that an average grade of rubber-stamp ink now retails at $20 a gallon, business firms, making use of any number of indelible pencils, will find it quite profitable to have a receptacle about the office for collecting stubs to be later turned into stamping ink and writing fluid.—John Edwin Hogg, Alhambra, California.

A Convertible Wheelbarrow

Two faults of the ordinary wheelbarrow may be avoided by building a new type, with these two points in mind. The wheelbarrow, as a rule, is extremely awkward to dump a load from, and, in the garden type, has removable sides which are usually left in some out-of-the-way place by the gardener. A stout wheelbarrow can be made with combined frame and handles of galvanized pipe, using a heavy bolt for the axle of the iron wheel. The front of the body is braced firmly to the frame, while the bottom and sides are fastened together, and revolve on a bolt axle. This arrangement allows the load to be dumped very quickly, and also permits the barrow to be used bottom up, when no sides are needed. The body is held firmly in place when used in the normal position, by resting against the front board, which is set at an angle, and by two buttons on the front board. When inverted, two hooks on the front board fit into two screw eyes on the bottom. The legs may be either of wood or pipe, firmly braced.—Charles Black, Jr., Hightstown, N. J.



A Wheelbarrow with the Body on an Axle is Easily Dumped, and Quickly Converted to the Platform Type

The Warping of Wood

By CHARLES A. KING

BY making use of the conditions which produce changes in wood, it is theoretically possible to prevent entirely the warping of building lumber. It would be neither practicable nor desirable to apply the controlling methods upon a commercial basis, as the ordinary warp and twist can be eliminated while the lumber is being worked. However, there will be instances where special boards will need to be treated, to remedy or control their natural tendency to warp.

Nearly every kind of wood is greatly affected by moisture, which the fiber absorbs. As the wood becomes filled with water the board expands or becomes wider. The effect of heat is to draw this water out until the fiber contains the same degree of moisture as that in the air surrounding it; this causes the board to become narrower again. Thus, moisture reaching one side of the board only, will cause this side to swell or become wider, while the other side shrinks or remains the same, being in drier air; this swelling of one side of the board and shrinking of the other causing it to assume a curved form, or to "warp."

The effect of these conditions upon the length of a board is so slight that it is rarely considered. Their effect on the flat surface may be demonstrated by laying a board upon the ground where the sun will strike it. Soon the board is resting upon its middle. By turning it over, the same conditions acting on the other side will remedy their own effects.

No wood was ever so well seasoned that it would not be affected to some extent if exposed to trying conditions. Some are affected more than others, depending upon the nature of the wood, the part of the tree from which it was cut, its previous seasoning, the relation of the annual rings to the surfaces of the board, and upon which side the heat or moisture is the greater.

Some kinds of wood warp, or change form, more than others under the same conditions, which fact largely governs the selection of woods for different purposes. The pines, cedars, and other coniferous woods are less likely to change form under adverse conditions than the wood of deciduous trees; spruce is an exception to this rule, being one of the worst woods known to warp. Gum wood, sycamore, basswood, and whitewood, or poplar, are the deciduous woods which are most likely to cause trouble.

There are different ways of controlling the tendency to warp and of minimizing its effects, but the usual method is to cleat, or fasten securely, wood which is likely to warp. Upon the best class of work careful selection of wood is made, to

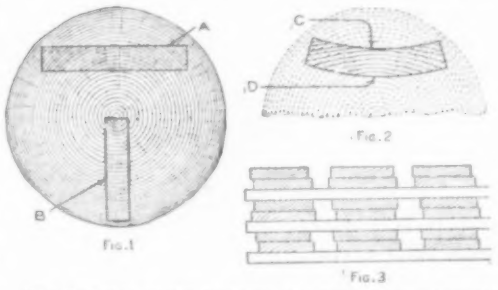


Fig. 1 Fig. 2 Fig. 3

The Relation of the Surfaces of a Board to the Annual Rings of the Log Determines the Extent of Warping

see that it is suitable for the purpose in view, and to ascertain its relation to the annual rings of the tree from which it was cut, or whether it was plain or quarter-sawed. A board cut from a log as at A, Fig. 1, in which the surface of the board is tangential to the direction of the annual rings, will be almost sure to warp. One sawed as at B, with the annual rings at nearly right angles with its surface, will not warp under ordinary conditions.

The tendency of a board in shrinking is to straighten its annual rings, as indicated in Fig. 2, which will cause the outside of the board to become hollow or concave, as at C, and the inside to become rounding, as at D. The terms "outside" and "inside" allude to the relation of the board to the outside of the tree and the pith, and may be discovered by looking at its end and noting the direction of the curve of the annual rings; the side of the board tangent to the rounding side of the annual rings will be the outside, and the side which grew nearer the center of the tree will be the inside. These terms apply only to the slash, bastard, or plain-sawed boards, shown at A; it is plain that the edges of a quarter-sawed board, as at B, will form its inside and outside.

The tendency of a board to warp may be minimized by placing it with its outside to the moisture or the cooler air, which will tend to make that side wider, or to minimize its shrinking, and the inside to the dry or warm air, which will modify its natural reluctance to shrink. Warm air applied to the outside will cause the board to warp more than if applied to the inside; often, for this

reason, boards are piled in double courses with their outsides together, as in Fig. 3, which prevents the dampness from evaporating too rapidly through the pores of that side, and resists the tendency of the boards to warp. It is plain that if the inside of each board is exposed to the

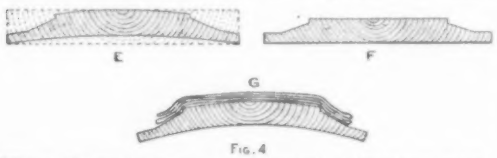


FIG. 4
When Curved Boards are Needed, Advantage may be Taken of the Tendency to Expand When Moistened

air, it will dry out faster than the outside, thus reversing the natural tendency of the board to become rounding upon the inside.

The top and bottom courses of a lumber pile are likely to warp as the air strikes one side more freely than the other. For this reason, boards upon the top of a pile should be turned over occasionally; especially must wide kiln-dried boards be cared for or they will warp badly. The bottom boards should be treated the same way, but the effect of the air striking one side of these will not be so injurious as in the top course, and being at the bottom of the pile, it would not be expedient to turn the entire pile over, though if expensive lumber is being cared for, it should be repiled every few months, which will do much to prevent extreme warping.

In some places, it is the custom to stand wide boards upon one edge or end in such a way that there will be free circulation of air around them, which is the most favorable condition to keep kiln-dried boards from warping. Probably green boards would warp somewhat, even if they were piled in this way. Until green boards have become quite well dried, they should be kept in a pile under pressure of the weight of the boards above them.

There is no process which will prevent wood from shrinking if it is exposed to trying conditions, though warping may be minimized by impregnating the wood with chemicals which repel moisture. The steaming of wood has a beneficial effect upon it. Lumber thus treated is not affected to the same extent as that dried by ordinary methods. Wood which is to be used for any purpose in which its grain or color are important considerations, should not be treated chemically, as its appearance will be injured, and it cannot be finished satisfactorily. Certain chemical treatments make wood practically waterproof, insect-proof, and slow-burning, besides practically destroying the tendency to warp, but they leave the wood badly discolored.

If a board has become warped, it may be straightened by applying, as a remedy, the same condition which caused the defect; in other words, by applying moisture by means of wet sawdust or a folded cloth to the hollowing side, or placing the rounding side to steam pipes or other heat, or by both. A board laid, hollowing side down, upon a bed of moistened sawdust or folded cloth, or upon a cold or damp surface to prevent contact with warm dry air, can be made to resume its original form. When the board has straightened, or, if anything, warped a little the other way (for it will tend to straighten itself while drying), the sawdust or cloth may be removed and the board dried.

The principle involved in making a warped board straight may be applied in making a straight board curved; for instance, in making the panels for curved panel work fit the curve of the rails. It would be difficult to mold the face of a panel, which had been made to a given curve, by cutting the wood away, as at E, Fig. 4. After molding the panel while it is straight, as at F, the wet sawdust or cloth should be placed upon the side which is to be rounded, as at G; the other side being tried frequently by a pattern slightly more curved than the panel is to be, since it will straighten somewhat in drying. The moisture is removed when the desired form has been reached.

Crossing the grain and gluing pieces of wood together, as at H, Fig. 5, will not hold the pieces in shape if they start to shrink, and the boards will wind, as at J. If fastened together with screws or nails without glue, which will allow each piece to shrink and swell a little, there will probably be no trouble with warping. If the desired thickness is built up in three or more layers of well seasoned wood, with the grain of adjacent layers crossed as in Fig. 6, the board will usually hold its shape unless exposed to so much dampness or heat that the glue is affected and the layers separate. Wide boards built up of veneers are an extension of this method of making boards hold their shape.

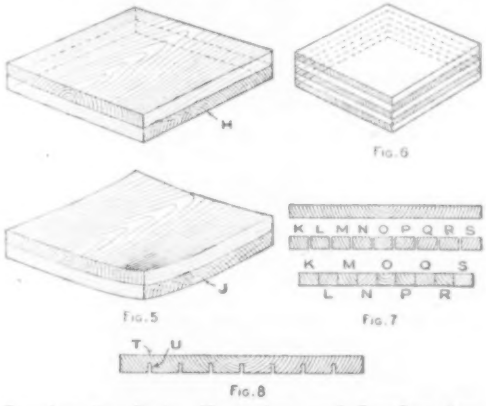
Usually, splitting a board in narrow strips and turning alternate strips end

for end, then gluing, as in Fig. 7, will make it hold shape under conditions which are not bad enough to soften the glue; drawing boards made by this method are satisfactory. Such a board, surfaced and veneered, is an example of the common method of gluing a wide board where the best results are desired, and where building up in layers is not practicable. The cores of high-quality veneered doors are glued up by this method. A board veneered upon one side only will be almost sure to warp unless it is fastened to hold it in shape.

The method of preventing the warp of a board by scarfing, illustrated in Fig. 8, is not desirable. It weakens the board and is not highly efficient; the same method is applied in bending wood either in width or length, as in a circling stair riser. The board will still warp in the thickness from T to U, and if the edges are fastened, the shrinking of the board will make it split along the line of one or more of the saw cuts.

Owing to the tendency of all wood to shrink in a direction parallel to the annual rings, quarter-sawed oak shrinks proportionately more in thickness than it does in width, but its tendency to warp is slight, compared with a plain-sawed board.

It is trying to the patience to discover that a panel in a piece of furniture or wainscoting has become warped, and cannot be straightened without tearing it out. Often this is caused by its being finished

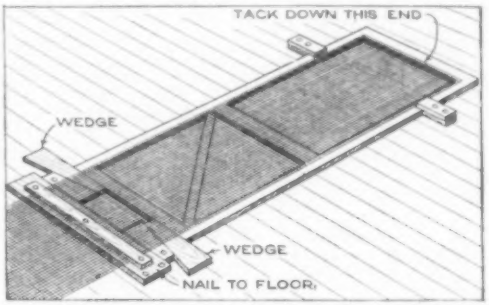


Crossing the Grain, Veneering, and Scarfing Are Methods Used to Prevent Warping, All Being Successful under Reasonably Favorable Conditions

upon one side only, and may be remedied or prevented by giving the back side of the panel work a coat of paint. This will prevent the air from affecting the pores of the back more than it does the face side, which is protected by the finish.

Renewing Wire Screening on Old Screen Door

Among the jobs that fall to the average householder, stretching new screen on old door frames, as fly time ap-



The Use of Simple Wedges and Clamps Aids in Renewing the Wire on an Old Screen Door

proaches, is far from being the least bothersome. A method that has worked well is shown in the accompanying sketch. The screening is tacked securely along either the top or bottom of the door, which is then laid flat on the floor, or workbench. A strip is nailed to the floor or table, and wedges are placed in the position shown between the door and strip. After stretching the screen as much as possible by hand, it is held in place by nailing another strip on top of the first to clamp the wire. Next, drive the wedges in toward each other until the proper tension on the screen is secured, then tack all edges of the wire to the door frame and put on the moldings. If the door shows a tendency to rise off the floor under the tension of the wire, use guide clamps as shown, but these will seldom be found necessary.—Warren Ichler, Decatur, Ill.

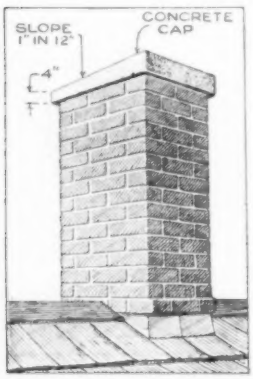
Attachment Plug Used as Fuse Plug

An electrical experimenter who found the expense of replacing blown-out fuses to be increasing badly, owing to high prices of fuse plugs, decided to use an attachment plug, with a piece of fuse wire connected to the screws, in place of the cord leading to the lamp. Such fuses are readily repaired by connecting in a new piece of fuse wire.—Howard D. Wildman, Schenectady, N. Y.

¶Keep an ordinary rubber washbasin plug handy. It is useful in case the threaded plug of the grease trap on the basin is rusted, mislaid, or broken.

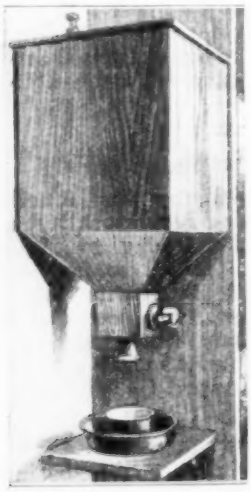
Chimney Cap of Concrete

The life of many a chimney would be greatly lengthened if a concrete cap was made for it when built. The cap holds the chimney in alinement, prevents the top bricks from becoming loose, acts as a watershed, and the chimney looks much neater than if no cap is used. Such a cap will add years to the life of an old chimney, but any loose bricks at the top of the chimney must be carefully cleaned and set in fresh mortar before the concrete is put on. The concrete cap should project 1 in. beyond the brick on all sides of the chimney. On the top it slants, with a fall of 1 in. to the foot, the concrete being 4 in. thick at the thinner edge. The cap should be made by tamping a rather dry mixture—1 part cement, and 4 parts sand—into a form made the proper size for the chimney. When dry it is set on the brick with ordinary mortar.

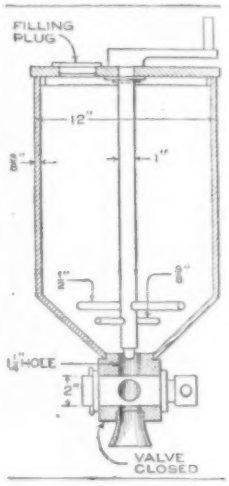


A Timesaving Sugar Bin

The objection to most sugar bins and boxes is that when the sugar gets lumpy, it will not flow out freely. The photograph shows a bin which will save a great deal of time by providing a free and regular flow of sugar from the bin to the cooking vessel or sugar bowl. Particularly is such a bin useful when a certain weight of sugar is to be added to a mixture for cooking, as is often done by the more modern cooks. The vessel can be set on the scale directly under the bin, and the sugar turned on like water at a faucet. The flow can be made rapid at first, then slow as the required amount is nearly reached.



The main body of the box is made of ⅜-in. hard wood, joined together with nails through corner blocks. The joint can be strengthened at the corners by gluing over it, on the inside, a piece of heavy canvas. At the lower end of the bin is a hopper bottom, in which is inserted a block, cut from 4 by 4-in. wood. This block is dressed down to the shape indicated, the upper part being fitted in between the four sides of the hopper bottom, and nailed into place. There are two large holes through this block, the vertical one being 1¼ in. in diameter, and extending straight through the block from top to bottom. In the bottom of this is set a spout, out of which the sugar flows into the vessel below it. A horizontal hole, 2 in. in diameter, should intersect the vertical hole, the center of one passing through the center of the other, as closely as possible. The horizontal hole is to take the valve, made of 2-in. round wood, which is shown in the detail. This valve has a 1¼-in. hole bored through it, in such a position that when turned so that this hole is vertical, it forms with the vertical hole through the block a continuous downward passage for the sugar. When the valve is turned at right angles to this position, the flow of the sugar is stopped. A handle is provided at the end of this rotating valve, and it is important that the hole for this handle should be bored exactly parallel with the large hole through the valve.



The mechanism for breaking up the lumps in the sugar consists of a piece of 1-in. round wood, which should be clear and strong, extending downward through the middle of the bin, with a crank at its upper end, and two or more pieces of dowel stock set through it in the space inclosed by the hopper bottom. This vertical shaft rests very loosely in the hole through the large block at the bottom, but the hole forms a sufficient lower

bearing, even though the shaft is loose enough in it so that the sugar will flow out around the lower end of the shaft. The round pins for breaking up the sugar lumps should be of about the proportions suggested in the sketch. The crank at the top of the shaft should have plenty of strength, but if made of hard wood, it need not be larger than suggested in the sketch and in the photograph.

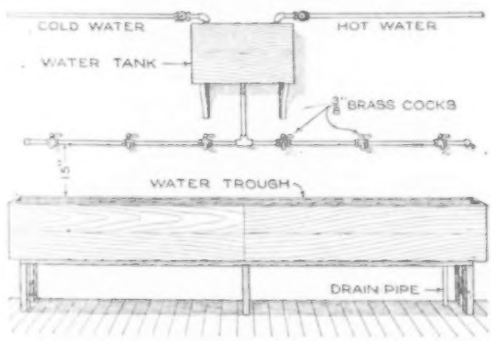
For filling the bin with sugar, a hole may be provided in the top, with a plug, as shown in the sketch. This is not really necessary, however, as the whole top of the bin lifts off quite easily, and the bin should be made large enough so that it will not have to be filled oftener than once or twice a month.

Repairing Leaks in Galvanized Vessels

An inexpensive, practical way of repairing leaky galvanized pails, tanks, tubs, or other receptacles, is to place approximately ½ in. of building cement in the bottom of the article to be repaired, and mix with water to the consistency of thick paint. This mixture fills all the cavities, leaving, when dry, a waterproof, durable repair. Of course this adds some weight to the article mended.—Ed. Haberlein, Jr., McPherson, Kan.

Sanitary Individual Water Faucets

In a factory where a number of men wash at the same time, the washbowls become dirty and unsanitary very quickly. The inexpensive system described provides a faucet for each man, insuring clean water for him. Cold and hot water

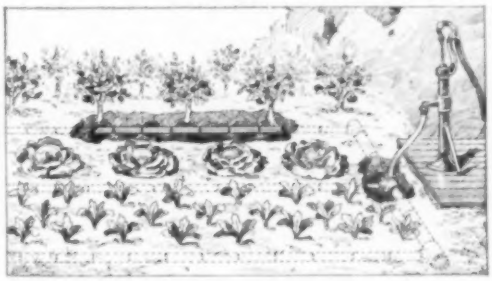


Individual Faucets in a Factory Wash Room Provide Clean Water for Each Employe

are supplied to each faucet from a tank into which the mains empty. A trough with a drain carries off the dirty water. —Roy H. Poston, St. Francois, Mo.

A Simple Irrigating System for the Home Garden

By using some form of irrigating system, a small piece of ground will produce a marketable crop at a time when



Water Pumped into the Tile Once a Day during Dry Weather Insures Sufficient Moisture

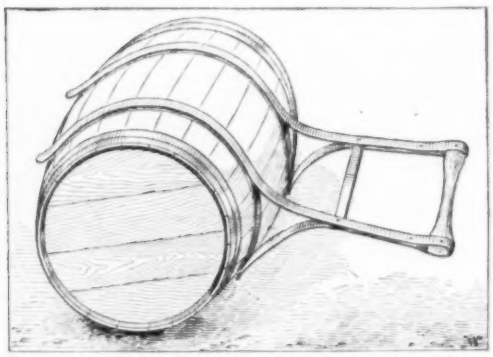
prices are high because of the supply being short. The system described is not designed for a large area. Near a source of water pressure, such as a hydraulic ram, windmill, or hydrant, a line of 6-in. glazed tile, with T-connections every 6 ft., is laid 1 ft. below the surface. From each connection are laid parallel lines of 3-in. unglazed tile. The joints of the glazed tile are cemented, but the unglazed tiles are merely placed end to end, allowing the water to percolate into the soil more rapidly than it would by merely soaking through the tile. The fall need not be more than 1 in. in every yard. When the trenches have been filled in, the system is ready to use, water being supplied by a pump, or hose from the hydrant to the glazed tile. A tomato patch, 20 by 30 ft., with the plants set 3 ft. apart each way, and irrigated for a few minutes night and morning by three lines of tile, will produce a crop which will more than pay for the tile and labor in one season.

To Keep the Reins from Catching on the Wagon Pole

An old ax helve, or similar piece of wood, cut to a length of 15 in. and wired to the end of the wagon pole with a loop of wire through a hole drilled in one end of the stick, will keep the lines from getting caught under the pole. The stick hangs from the end of the pole, making it almost impossible for the reins to catch, no matter how low they fall. The neck yoke can be put on by slipping it over the stick first.—J. E. McCormack, Haliburton, Ont., Can.

A Handle for Rolling Barrels

The difficulty in handling barrels usually arises in the fact that it is so hard to hold them. This is especially true

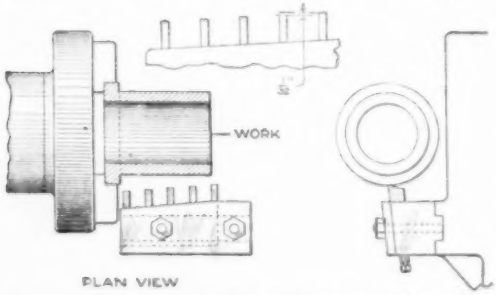


Barrels are Easily Pushed or Rolled into Place When a Special Handle is Used

when they are to be rolled. A handle made from 1¼ by 5/16-in. strap iron will make the work much safer and easier than the usual method of pushing or kicking the barrel along. The straps reach about halfway around the barrel, and have a wooden or pipe handle and a strap-iron brace to make the device rigid.

Tool Holder for Cutting Rings from Tubing

Machining rings is often a very laborious process where each ring is cut and turned separately. The work is easily and quickly done by using a special cross-slide block which holds a number of cut-off blades. The block is mounted on the cross slide with the gang of cutters set so that each is 1/32 in. ahead of the next one. The result is that while one ring is



A Special Cross-Slide Block Holding a Gang of Cut-Off Blades Saves Time and Labor in Machining Rings

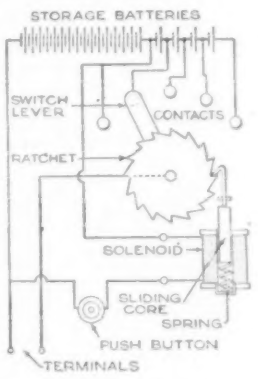
being cut off completely the others are still supported. The stock of which the rings are to be made is gripped in the chuck, and may be bored and turned as usual. This method of making rings saves most of the time generally consumed in changing tools.

Renewing Mouse Traps

Mouse traps of the ordinary wire-spring type may fail to work when the spring becomes so weak that the mouse is permitted to escape. It is possible, in such cases, to renew such traps by winding the spring an extra turn around the center wire, so that the force of the spring is increased.

Remote Control for Storage-Battery End-Cell Switch

Where storage batteries are used for lighting purposes, it is the usual practice to provide a number of extra end cells that can be switched into the circuit as required, to keep the voltage constant while the cells are discharging. An easily constructed remote-control switch for these cells is shown in the diagram. The switch lever is fitted with a toothed wheel, cut or filed from heavy sheet iron. A magnet coil or solenoid is wound on a brass tube, ¼ in. in diameter, fitted with heads, 1 in. in diameter, and separated 1¼ in. This space is wound full of No. 24 gauge enameled-copper wire. The core is a length of soft-iron rod that slides easily in the tube, and which is slotted at one end to take the hook made from a piece of clock spring, held in place by a rivet. A small coil spring serves to raise the core when it is released by the magnet.



A push button is connected with the solenoid, as shown in the diagram. When the push button is pressed, the solenoid draws the core down, turning the switch one point, thus connecting one cell to the current. The button may be mounted in any convenient place, and the switch advanced one point when the voltage is noticed to be dropping. The switch is replaced on the first point when the batteries are being recharged.—Thos. W. Benson, Philadelphia, Pa.

A Simple Carrier System for the Greenhouse

By J. HORACE VAN NICE

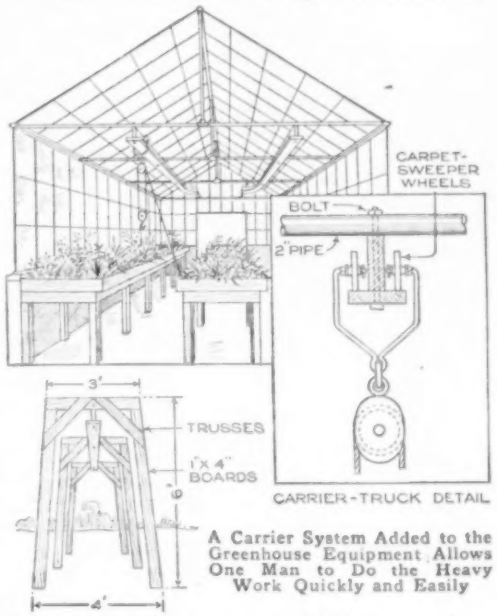
SINCE a greenhouse is usually built with narrow aisles, it is difficult to move heavy loads of earth or plants either in or out of the structure. Yet, among the florist's regular tasks are those of changing the dirt in the benches—the hardest work of the year—and the almost daily task of moving potted plants, or other stock, from one part of the house to another. The carrier system described, while designed originally to relieve the situation in and about the greenhouse, has helped solve the labor problem all about the truck garden, and has been adapted to the needs of a baker and a machine-shop owner who saw it in operation.

Two units, or members, make up the system; these are a carrier, and a track upon which it runs.

The track was made from 1 by 4-in. boards, bolted together to form an inverted "T." Since the completed track could be cut and fitted like a single piece of lumber, each greenhouse was quickly supplied with sections extending the length of each aisle, with turns to the doorway. Space was left between the track ends and the front wall of the greenhouse, so that the carrier truck could be put on or taken off each track. Hence but one carrier truck was required, as it could be quickly changed to the section of track leading to the spot where the load was to be dumped. The track was bolted to the cross purlins through holes drilled in the purlin pipe.

For the carrier truck, two small rubber-tired wheels were taken from a discarded carpet sweeper. These were put on the ends of a steel-rod axle, which was bent to loop under the track upon which the wheels rested. On one side of each wheel a washer and a large bushing were used, the latter made of a nut drilled larger than the rod; on the other side were placed a washer and a cotter pin. Into the loop was wired the eye of a tackle block.

In operation the carrier system was both simple and effective. Dirt was brought to the greenhouse door in a wagon. Here it was shoveled into a large galvanized-iron bucket holding about a wheelbarrow load; pulled up to the track by means of the pulley, so as to be out of the way of the benches, and handy for dumping; then pulled along the track to the place desired—all the work being done by one man, and without overexertion. The large loads were easily handled, and filled up bench space rapidly. For potted plants, a flat was slung from the truck on four wires. By steadying it while drawing it along the track, 25



A Carrier System Added to the Greenhouse Equipment Allows One Man to Do the Heavy Work Quickly and Easily

large potted plants could be moved at once, in spite of the narrow aisles, by the one man.

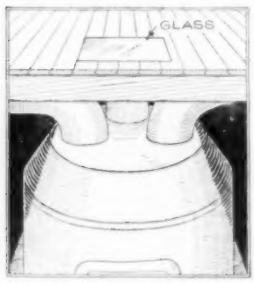
Since there remained the work of bringing the dirt to the greenhouse itself, and because of the waste of time in transferring the dirt from the wagon to the bucket, the system was later extended by supporting a track, on cheap trusses, from the greenhouse to the dirt pile, as illustrated. In this way the entire operation was performed by one man, without the aid of a horse. This track being movable, it was used for several odd jobs, such as moving the crops in from the truck garden, carrying coal to the boiler room, and fertilizer to the garden. While the first cost was large, the many uses of the system made it pay for itself.

Blotter Mounted on Desk Telephone

One place to mount a blotter, where there is small danger of its becoming lost, is on the bottom of the desk telephone. While a handier blotter should be provided for regular use, it will often save time to have this peculiar arrangement ready in case the blotter is required suddenly and the ordinary one has disappeared.—Violet Johnson, Rockford, Ill.

Furnace Lighted from Room Above

A furnace fire may be tended to in the evening without carrying a light or matches to the cellar, by placing a heavy pane of 8 by 10-in. glass in an opening cut in the floor above the furnace. This pane of glass is placed in the floor border, and does not interfere with the rug. It lights up the space near the furnace as long as there is a light in the room above. In homes where electric lights cannot be had, it should be very handy.—Edward Stumpf, Jersey City, N. J.

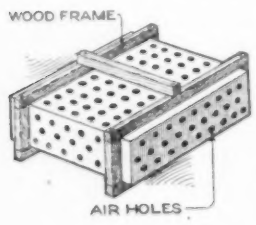


Portable Gas-Welding Outfit

Oxyacetylene welding is used in most shops and factories for repair work, but, as a rule, the outfit is stationary. Thus, all machinery requiring welding must be dismantled and taken to the welding bench. A much better and quicker method is to mount the oxygen and acetylene tanks on a hand truck, so that the complete welding outfit may be transported to the job. Often this scheme saves lifting and trucking heavy castings. The gas tanks are strapped to the truck in such a manner that new tanks may be substituted for the exhausted ones, without halting the work for any appreciable length of time.—Kenneth Coggeshall, Webster Groves, Mo.

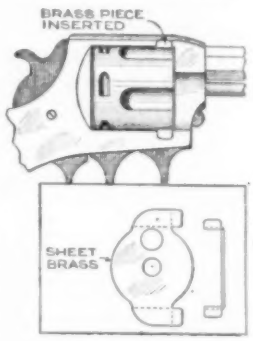
Chicks Provided with Air during Shipment

Much trouble is experienced in shipping very young chicks, even when using the corrugated-paper shipping boxes, prepared for that purpose, because they receive so little air on the trip. This is due to the fact that these boxes are sandwiched in between other packages. The difficulty may be overcome by surrounding the shipping box with a wooden frame which keeps other packages from coming completely in contact with the paper crate. Adequate ventilation may be insured by punching numerous holes in the corrugated board, for the wooden frame provides an air space, no matter how many parcels are shipped together. A stick across the top pieces serves as a handle, and holds the sides of the frame rigidly together.—J. T. Bartlett, Fort Collins, Colo.



Curing Revolver "Spitfire"

A revolver that was satisfactory except for the common fault of many low-priced guns, that of spitting fire sidewise at the forward end of the cylinder, on account of there being too much space between the cylinder and the barrel, was remedied in the following manner: A piece of sheet brass, of a thickness that nearly filled the space, but left play enough for the cylinder to turn freely, was cut as shown in the drawing. Two holes were drilled, one for the bullet hole and one to fit over the projection on the cylinder. They were reamed out to the proper size with a taper reamer. The piece was bent, as shown by the dotted lines, making it fit over the cylinder, after which the gun was assembled. This eliminated the annoying side flash, and gave more shooting power by keeping the gas in the barrel behind the bullet. The sides of the piece, covering the holes in the cylinder, were to keep lint and other foreign matter from collecting around the bullets. No dimensions are given, as the design and caliber of the revolver determine them in each case.



Keeping Salts in Battery Cells from Creeping

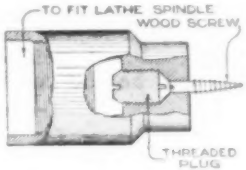
Paraffin is used almost universally for coating the tops of the glass jars of wet-cell electric batteries, to prevent creeping of the salts. Sometimes the paraffin is colored by mixing in it, while it is molten, paint powders of different hues. Green and red pigments have thus been used frequently. To coat the top of the cell it is dipped in a vessel of molten paraffin

to the proper depth, or the hot paraffin is applied with a brush.

One black compound which has given satisfaction for use on the tops of dry cells and also for coating the tops of carbons is composed of equal parts of tar and pitch. Another is composed of pitch, 1 part; lampblack, 1 part; paraffin, 8 parts. This mixture is heated until molten, then mixed by stirring. It can be put on either with a brush or by dipping the carbon in it.

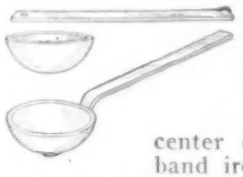
Screw Chuck with Removable Screw

One of the most useful types of chuck to the pattern maker is the plain screw chuck having a center like a wood screw, on which the piece to be turned is held. The objection to the use of such chucks is that the threads of the screws usually get damaged by being knocked against metal surfaces. The chuck shown in the sketch presents the feature of a removable center, which consists of nothing more than an ordinary flat-head wood screw. The body of the chuck is threaded to fit the lathe spindle, and in the other end is a hole in which some common size of wood screw fits snugly. The screw is held in by a threaded plug, and it is a matter of only a few seconds to remove the plug and screw and insert a new screw.



Ladle for Lead or Solder Made from Alarm-Clock Bell

A small ladle for soft metals, such as solder, lead, and pewter, may be made of the bell from an old alarm clock and a piece of band iron, ¾ in. wide, ⅛ in. thick, and 10 in. long. In the center of one end of the band iron, drill a hole the same size as the hole in the bell. Bend the band iron in a vise so that when the two holes come together the band iron will fit the surface of the bell. Rivet the band iron to the bell to form a handle, and bend it back a little above the edge of the bell. If the bell becomes loose, a second rivet may be put through the handle and bell, farther up.

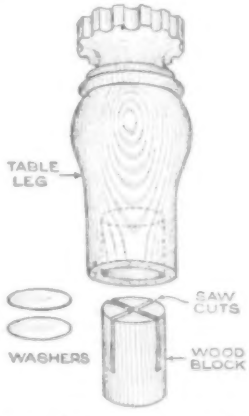


Barrel Supported on Fellies from Old Wagon Wheels

Old fellies, such as used to form the rims of wide-tired wagon wheels, can be used to support barrels, or galvanized-iron tanks. Two sections are bolted together, with their curved surfaces opposed, as shown in the drawing, to form each support. Small wooden blocks, nailed in the angles, give added strength. For a barrel, the center felly must be larger than the end fellies, and the center base felly must be cut lower than those used for the bases of the end supports. The trestles formed in this way may be fastened together with longitudinal braces, but this is not always necessary. The fellies form an unusually strong support.

Table-Leg Adjuster

A table is often unsteady because the floor on which it stands is uneven, and not because the legs are of unequal length. It is a mistake to cut the legs whenever moved, as the table would only be unsteady again if moved to another place. A good and simple adjuster can be made by drilling a fairly large hole into one of the legs, and inserting a tightly fitting plug of hard wood, as shown in the illustration. If the plug is made a tight, springy fit by two saw cuts, it will be found to spring in easily without a tendency to drop out. Adjustment of height is made by putting one or more thicknesses of cardboard on top of the plug. The leg in which the adjuster is fitted should be cut down ¼ in. so that it can be made higher or lower than the others by means of the plug.—Morris G. Miller, New Rochelle, N. Y.



Paper Streamers in Motion Scare Flies Away

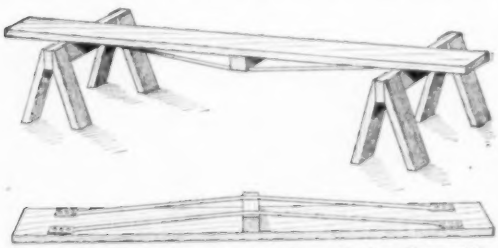
In a bakery, or other place where the flies are troublesome, use may be made of a device which drives the pests away from

A Mechanically Agitated Wire Hung with Paper Streamers Drives the Flies Away from Food in a Bakeshop

the food which attracts them. On a wire stretched above the counter, are pasted numerous streamers of paper. A long coil spring at one end of the wire permits it to be pulled to one side, and then jerks it back into place. A fan motor, with a small grooved pulley substituted for the fan, is placed on the ceiling over the wire. A large wheel, such as found on sewing machines, is held in place just above the wire by a hanger from the ceiling and is belted to the motor. A connecting rod pivoted to the wheel, and clamped to the wire, keeps the streamers in a flutter when the motor is running, thus driving all flies away from the vicinity.—C. C. Spreen, Detroit, Mich.

A Nonsag Scaffold Plank

A plank for a scaffold can be made rigid enough to sustain the weight of one or two men without springing uncomfortably, by bending light iron rods over a short piece of 4 by 4-in. lumber placed in the middle of the plank. The ends of the rods are flattened and drilled for screw holes. When inverted between two "horses," the plank so prepared has none of the usual spring of an ordinary board. It is especially fine to use with ladders.—John C. Smith, Seattle, Wash.



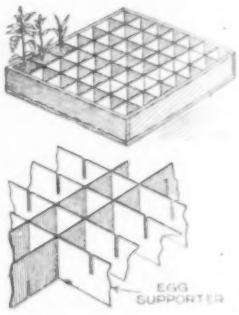
A Scaffold Plank Braced with Iron Rods, That will Not Spring under the Weight of Two Men

Filling Up Cracks in Concrete

For permanent repairs in cracked concrete, use old newspapers soaked and softened in linseed oil. Clean out all dirt from the cracks or joints, then paint them on the inside with red lead and oil. When this is hard and dry, fill the cracks with the soaked paper, smooth off with sandpaper, and, if well done, a nice smooth job will be the result.

A Spacer for Growing Plants

Plants to be transferred to the garden should be removed without disturbing the soil about the roots. This is easily accomplished if, at the first transplanting, they are set into a flat divided by an egg-crate spacer.



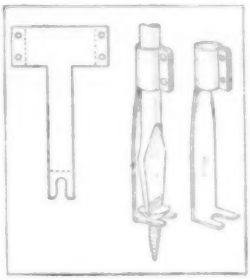
Testing Seed by Placing It in Water

From time to time gardeners have old seed on hand, and they do not know whether to risk using it or not. Since the need for economy in seeds is so great it is important that no live stuff should be thrown away. Although a few vegetable seeds, such as those of parsnip, carrot, peas, and beans, are very unreliable after the first year, many kinds, if kept damp-free, retain their vitality for a much longer period. A sure test for seeds is easily made. Get a bowl into which is placed 4 or 5 in. of warm water. Then scatter a few of the seeds on the surface. After an interval, some of the seeds sink to the bottom while others remain floating. It is always the dead seeds that go down, and the live ones that keep on the surface. The time needful for carrying out the experiment varies. The seeds of

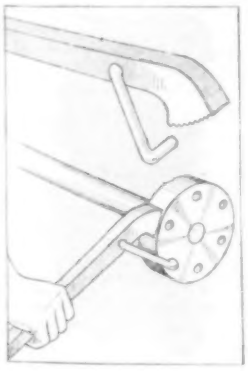
cabbage, radish, and turnip, for instance, sort themselves out at once. Those which have wings, like the parsnip or carrot, or are protected in a kind of a shell, such as beet, take longer, owing to the air with which they are surrounded. Sooner or later, however, the dead seeds go to the bottom. In the case of those seeds which are slow in answering the test, the decision may be hastened by rubbing them between the thumb and finger.

Screwdriver Attachment Holds Small Screws While Starting

Small screws which are hard to hold while being started, or larger screws which cannot be held because of the awkward position made necessary by the work, may be handled easily by using a little attachment on the blade of the screwdriver. A piece of tin or other light sheet metal is cut to T-shape. At the head end four small holes are drilled, and at the other end a notch is cut. The head must be bent around the blade of the screwdriver and riveted through the holes bored. It should be tight enough on the blade to remain at any point to which it may be slipped. The notched end is bent at right angles to hold the head of the screw. By using this attachment, screws may be driven in awkward places, one hand only being necessary for the work. When not needed, the device may be slipped up on the blade.—George Simonson, Springfield, Massachusetts.



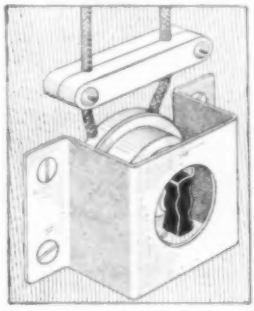
Pipe-Flange and Coupling Wrench



The sketch shows a handy and rugged pipe-flange wrench that is quite simple to construct. The foot, or point, of the wrench is curved, and may have teeth filed in it. Links of various sizes adjust the tool to a coupling or flange of any size.

Protecting Snap Switches

In barns, and other places where open-work electric wiring is installed, the breaking of switches is a common occurrence, since the knob and the porcelain base are exposed. This trouble may be avoided by protecting each switch with a No. 14 gauge sheet-iron guard. The iron, bent to the shape shown in the illustration, and screwed to the wall, or post, will protect the switch from ordinary knocks or bumps. A hole cut in the sheet iron, with its edge rounded off, permits the turning of the switch.—J. A. Weaver, Baltimore, Md.

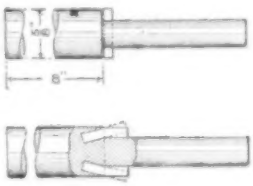


Make Drawings on Reverse Side of Cross-Section Paper

Drawings and curves, drawn on cross-section paper, or tracing cloth, to be blue-printed, are usually made on the same side of the paper or cloth as the printed crosslines. It will be found better to draw them, when possible, on the reverse side, so that changes can be made without erasing the printed lines.

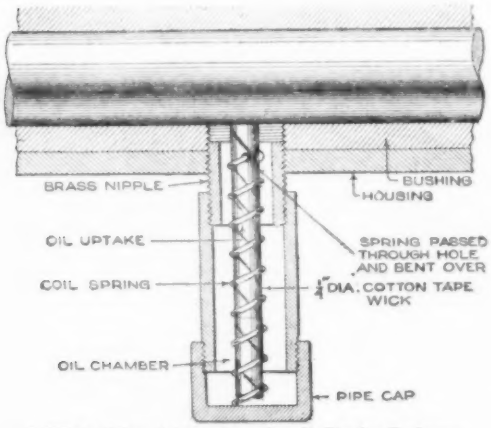
Inserting Drive Pins in Arbors for Shell Reamers

Arbors for shell reamers are quite often made as shown in the upper sketch. The strength of the arbor is thus diminished by the amount of metal cut out to form a hole for the pin. An arbor made as shown below is not open to this objection, and the full strength of the bar is retained. The pins set into the shank of the reamer do not affect the strength of the arbor, since the part from which the metal is cut out is not the point where failure would occur if overstressed. The projecting ends of the pins are hammered down flat, as shown by the full lines, and can be dressed off if necessary, so as not to project beyond the diameter of the reamer.—M. L. Lowrey, Livermore, Calif.



Homemade Wick Oiler for Small Shafts

Motor generator sets on some automobiles have no provision for oiling, other than holes in the bearings. Since it is



A Wick Oiler Adapted to Small Shafts Reduces the Danger of Burned-Out Bearings

easy to overlook these when pressed for time, they may be burned out because of having been run when dry. The wick oiler described, while not recommended for heavy work with large shafts, will supply the small amount of oil specified by the makers of automobile electric equipment. Into a hole drilled and tapped in the bushing and housing, insert a ¼-in. brass nipple. For the oil chamber, use a short piece of pipe, with a cap on the end. The wick is either a ¼-in. felt wick, or one made of heavy cord wound with cotton tape. This latter makes a very good absorbent wick. It is held against the shaft by a light coil spring, the upper end of which is threaded through a hole in the upper part of the wick, and clamped tightly around it. Such an oiler needs little attention, and is not difficult to make. It is filled by unscrewing the oil chamber from the nipple.—P. P. Avery, Garfield, N. J.

Setting Setscrews Tightly against a Shaft

Setscrews which must be drawn down very tight with a wrench will often twist off during the effort, and this always brings a troublesome situation. Setscrews can be made tighter without excessive twisting, if they are tapped moderately hard with a hammer while turning, after the point has come in contact with a shaft. In this way, the direct force from the hammer blows is added to the force produced by tightening the thread, the two working together to cause the end of the screw to sink into the end of the shaft and hold securely.

Cotter Pin as Electrical Clip

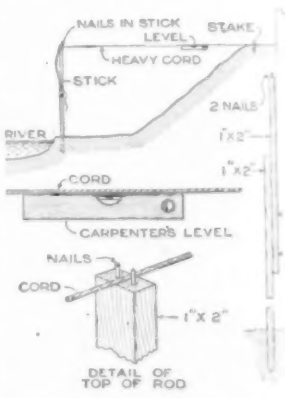
A split cotter pin, with a wire soldered to the eye, makes a good clip for the lineman's kit. It is easily slipped over the wire, and as easily pulled off, but makes good electrical contact.—H. F. Barwick, Shawinigan Falls, Can.

Spading Grass with a Garden Fork

A lawn in which the grass looks thin and dull-colored can be improved by using a garden fork to loosen the soil. The fork is sunk to a depth of 6 in. and worked back and forth until the dirt is loosened. The process is then repeated every few inches until the sod has all been gone over thoroughly. After putting on a light coat of lawn fertilizer, sprinkle well, using a fine, soft spray, or a length of pipe with several rows of very small holes drilled in it. The grass will be much healthier after the treatment, presenting a luxuriant thickness.—F. F. Burnstead, Long Beach, Calif.

Carpenter's Level Takes the Place of a Surveyor's Level

While it is often necessary to find the difference of level, or elevation above a certain level, of an embankment or uneven bit of land, it is usually expensive to hire a surveyor for the few minutes the work would take. Nor is his instrument obtainable by all. The work need not wait if a carpenter's level, two 1 by 2-in. sticks, a long cord, a stake, and some nails are handy. After setting the stake in the top of the embankment, drive one of the 1 by 2-in. pieces into the ground at some spot on the lower level. Into the end of the other 1 by 2-in. piece, drive two nails. This piece is to be held upright along the



one driven into the ground. Stretch the cord from the stake, between the two nails, down to where the hand grips the stick. Have some one hold the level against the underside of the cord, making sure that it touches the cord along the whole edge. Now raise the stick until the cord is level, then drive in nails to hold the two sticks together. The top of the stick is level with the top of the embankment, and the elevation of the spot where the stake was driven can be measured at once on the 1 by 2-in. pieces.

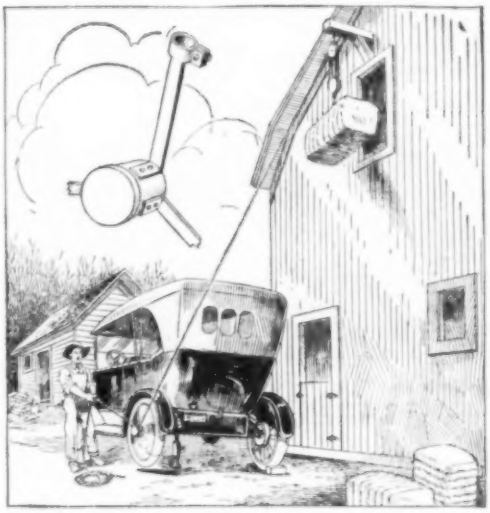
Tire Tool for Spreading Beads Apart

The simple tool illustrated makes easy the awkward job of separating the beads of an automobile tire for inspection, or for inserting or removing an inner tube. For tires of ordinary size, the short arm should be about 6 in. long, and the distance from the pin to the end of the long arm should be the same. By sliding the tool along, and spreading the tire at successive points, it will be found easy to get at the inside.—L. E. Turner, Hartford, Conn.

Hoisting Drum to Fit Rear Wheel of Auto

In cases of emergency, the rear, or driving, wheel of an automobile may be used as a drum around which the line from a hoisting tackle is wound. The power from the wheel, when turning free from the ground, is sufficient to exert great force in winding up the tackle rope. For that purpose, the drum described was designed to be attached directly over the hub, and to the spokes of the wheel. It may be quickly put on or taken off, and is small enough to prevent the wheel, when turning under normal speed, from being unduly strained by heavy loads.

A solid piece of oak, about 8 in. in diameter, should be turned out in the shape of a cylinder, 5 in. long. For large cars, this may be increased in size. Surmount the drum with a disk, somewhat larger, to act as a rim, and bore a hole in the opposite end of the drum just large enough to fit snugly over the hub of the wheel. Then make three arms of strap iron, long enough to reach a good way



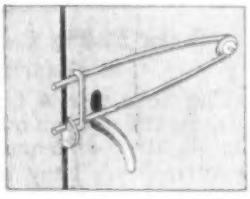
The Addition of a Small Drum to a Rear-Wheel Hub Makes Possible the Use of a Car for Hoisting

up the spokes of the wheel. Bolt these at equal distances around the circumference of the drum, setting them in flush.

To operate, back the car up until it is near the tackle, and jack up the wheel upon which the drum has been placed. The other wheel must be blocked so that it will not turn. Give the hauling rope a few turns about the drum, then apply the power to the wheel and at the same time pull easily upon the rope, keeping it taut on the drum. In this way heavy loads can be raised that would otherwise be beyond the ability of one man to handle.—L. B. Robbins, Harwich, Mass.

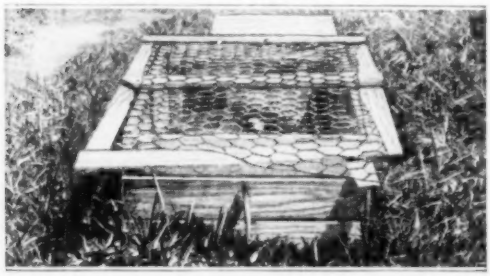
Door Latch Made from Wire

A spring door latch can be made in a few minutes, if a piece of rather springy heavy wire is at hand. It is wrapped twice around a rod or stick to form the spring, and the ends are cut to the proper length. The guard, which forms the door handle and takes the place of a knob, may be made of wire also. The catch is of the regular type used with lift-up latches, or can be made from a window-shade holder. A stick, or a piece of heavy wire, makes a very good lift.



Movable Chicken Coop Raises Healthy Chicks

Chickens never grow well when confined in a small coop, with no green food. The coop and run illustrated were de-



A Coop and Runway for Growing Chicks, Which can be Moved, Provides Fresh Green Food without Injuring the Grass Plot

signed to give small growing chicks the necessary plant food, without in any way injuring the grass in the lawn where they were kept. The coop was made from a packing box, covered with tarred felt to protect the chicks in rainy weather. The runway was a frame, made of miscellaneous old boards, covered with poultry netting. The space between the boards was large enough to allow the little chicks to slip out, and thus range over the lawn as they pleased, while the mother hen was confined. Since there were no trees, it was necessary to throw a piece of burlap sacking over the runway for shade during the hot part of the day. This portable coop and runway was moved every morning, giving the mother hen fresh grass, and the chicks a new range every day, at the same time leaving the grass uninjured. The runway could be adapted to city lots by making it impossible for even the chicks to escape. They would still have green food, though they would not get so much exercise, which is nearly as important as the food.—S. R. Winters, Washington, D. C.

Boiler Pitting Caused by Ground in Electric Circuit

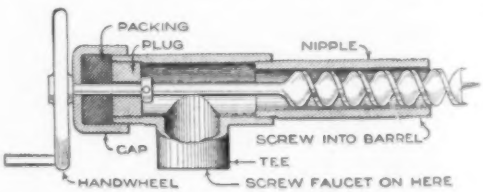
The boilers in a large plant had been in constant use for over 10 years without the slightest evidence of internal pitting or corrosion. They were practically free from scale, as the condensate was returned from the heating system and cooking apparatus, and the make-up water, about one-third of the total, was fairly good. Suddenly, pitting occurred to an alarming extent, and the engineer was completely at sea as to the cause. At about the same time, he noticed that the storage battery, supplying current for the house-telephone system and electric bells, was failing; that is, required much more frequent charging to maintain it at the proper strength. The battery seemed to be in fairly good condition, so grounds in the wiring were suspected. The engineer finally located the trouble in an underground metal conduit running from the main building to the power plant, in which were three twisted telephone pairs. When the wires from the conduit were pulled out, it was found that the insulation on all of them was water-soaked and rotten, and that the conduit was corroded through in many places. A new conduit and new wires were installed. This ended the battery trouble, and also the pitting in the boilers, which evidently had been caused by electrolysis, due to the current leakage.

Knee Guards for Tile Workers

A pair of discarded basketball, or football, knee guards make handy comforts for cement finishers, tile workers, carpet layers, and all others who are compelled to work most of the time in a kneeling position. Even a new pair of guards, bought for this use, will repay the worker in the convenience of these knee cushions.—Abel Green, New York, N. Y.

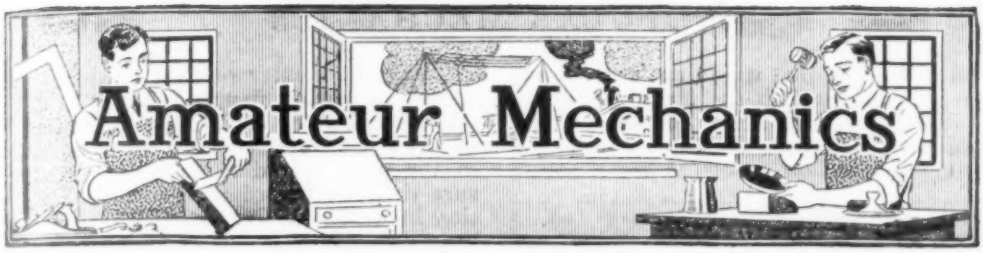
Screw Pump Hastens Flow of Heavy Oil

Where heavy oil had to be taken through a faucet from a barrel, the flow was often found to be so small that much time was wasted. The condition was remedied by installing a pump to help the flow of oil, which was made from a short auger bit, as shown. By turning the



Heavy Oil Which Flowed Very Slowly through a Faucet was Speeded Up by the Use of an Auger Pump

handwheel in the direction to force the auger inward, the oil is forced outward through the faucet.—H. W. Hahn, Des Moines, Ia.



A Toy Phonograph

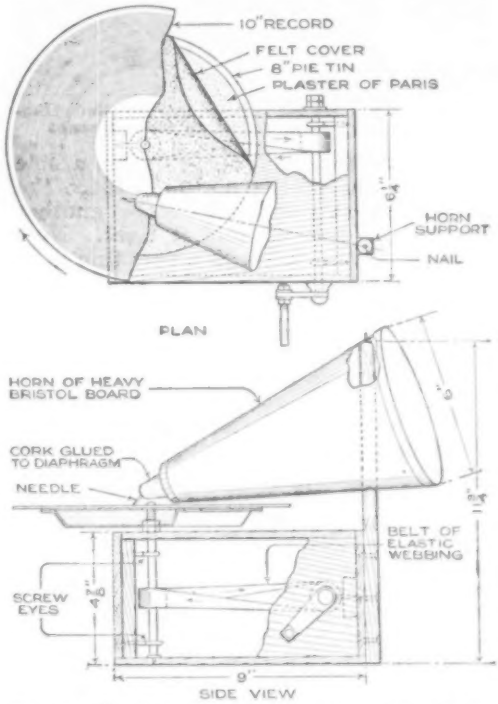
By FRANK M. RICH

A PHONOGRAPH seems very mysterious and complicated to the average boy. He can, however, make one for himself which will play the ordinary records quite satisfactorily. The machine described here is not hard to make, and does not require expensive materials.

Secure a small wooden box with a hinged top, to be used bottom up, for the base. Fasten blocks of soft wood into each end of this box on the inside, in the positions shown. This may be done by gluing them in and then driving several fine brads through from the outside, clinching them on the inside. Into one block, screw two small screw eyes, one ½ in. from the top, the other ½ in. from the bottom, and both of them 1 in. from one side of the box. Then bore a hole in the bottom of the box, on an exact line with the holes in the two screw eyes. A flat-headed tack should be driven into the lid of the box, also on a line with the holes in the screw eyes. Then secure a bolt long enough to go through both screw eyes, with the head resting on the tack, and the threaded end projecting 1½ in. through the hole in the bottom of the box. Wind adhesive tape, 1 in. wide, on the shaft of the bolt, halfway between the two screw eyes, to form a small pulley. Leave plenty of room for a belt between the pulley and the wood.

Now, insert two screw eyes into the block at the other end of the box, about 1 in. from the sides, and halfway between the top and bottom. Then bore holes through the sides of the box so that a bolt put through them will also go through the screw eyes. Before putting the bolt in, make a crank handle for it. This should be in two pieces, one of heavy tin or brass with a square hole cut to fit over the square shank under the bolt head, the other a wooden knob fastened to the heavy tin by a small bolt, with a washer and nut on either side of the tin, so that the wood handle will turn. Or this bolt alone may be used for a crank.

Put the crank and a washer on the large bolt, and slip it through the holes and the screw eyes. A washer and two nuts

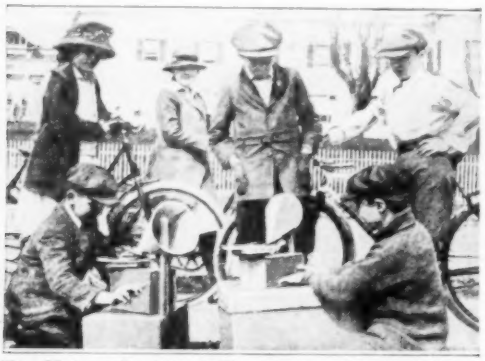


The Details of the Toy Are Simple, and the Materials Neither Expensive Nor Difficult to Obtain

on the threaded end will hold it, but it must be loose enough to turn easily. On the shaft of this bolt, wind tape to form a pulley, similar to the one on the other bolt. A belt of 1-in. elastic webbing, such as garters are made of, may be put around the pulleys, the ends being sewed with great care, so as to leave no hump. The belt should be just tight enough to grip the pulleys firmly. The top of the box may then be fastened with brads, or screws, so that it can be opened easily if necessary. It is to serve as the bottom of the talking machine, and may be covered with felt, or other soft cloth, such as cot-

ton flannel, so that it will not scratch any surface upon which the machine rests.

Place a nut upon the end of the bolt which projects from the top, or what was originally the bottom of the box. Secure



The Maker of a Simple Toy Phonograph Finds Himself Quickly Surrounded by Admiring Friends

an 8-in. pie tin, and cut, or punch, a hole in the center of the bottom. Place the tin on the bolt end, and screw another nut on the bolt to hold it tight. Now fill the pan level full with a very thin mixture of plaster of Paris and water. The end of the bolt should extend ¼ in. above this. While the plaster is drying, make the horn and reproducer.

For the horn, secure a sheet of heavy Bristol board. From it make a cone, 1½ in. in diameter at the small end, 6 in. at the large end, and 9 in. long. Fasten the edges with glue. Reinforce both ends of the horn with collars of the Bristol board. Upon a sheet of very stiff but thin paper, draw two circles, one 1½ in. in diameter, and the other 2 in., using the same point for the centers of both circles. Cut out the paper on the larger circle, then cut slots every half inch down to the smaller circle. Fasten this paper to the small end of the horn by pasting the flaps down over the Bristol board. This piece is to serve as the diaphragm of the reproducer.

The needle holder is a small cork, glued to the center of the diaphragm. A loud-tone steel phonograph needle is forced into the small end of the cork.

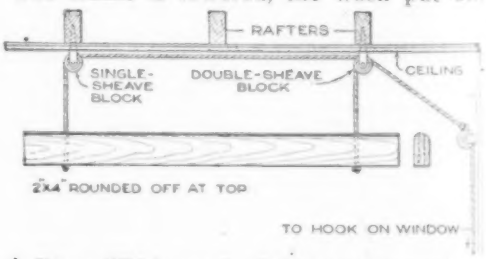
A thin stick, 11¾ in. long, is nailed or screwed to the corner of the box nearest the crank. A nail is driven into the end of the stick, and the head filed off. This is the horn support. A hole, 2 in. in diameter, cut in the horn near the large end, permits the stick to pass through. The nail in the stick fits into a hole in the opposite side of the horn. By this arrangement, the horn is permitted to swing around as the record is played.

Cover the plaster of Paris with a disk of felt or cotton flannel when it is dry. Then, to play the machine, place a record of any size on the turntable, set the needle in the groove, and turn the crank. Be sure that the record moves in the direction in which the needle points. After a little practice, it is not difficult to play a record smoothly and with a very good tone. Needles can be changed very easily, by pulling the old needle out of the cork and inserting a new one.

While the average boy can find most of the materials called for in the above description, the plan may be changed in many ways to suit either the convenience or the pocketbook of the reader, as long as the principle is right. The same boy may see a way in which he can improve on his first model. In any case, the results depend largely on how steadily the owner turns the crank.

Suspended Frame Dries Laundry in the House

In a house where there is very little room to spare, it is not easy to dry laundry on either the ordinary clothes rack or the wash line. The suspended frame described allows the wash to be pulled up out of the way while it is drying, in this way leaving the room clear for other purposes. A series of frames will hold a very large wash, and this should dry quickly, since hot air circulates near the ceiling of a heated room. The frame is made of a piece of 2 by 4-in. lumber, rounded off on one edge. It is suspended from ropes which run through pulleys to a hook screwed into some handy place. The frame is lowered, the wash put on



A Frame Which can be Raised and Lowered by Means of Pulleys is Used to Dry Laundry in a Crowded House

and then the whole is pulled up to the ceiling.—James Wilson, Maisonneuve, Que., Can.

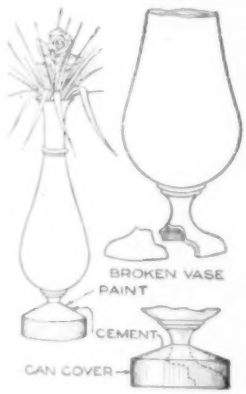
¶ Tennis rackets which are too old to be worth restringing make excellent carpet beaters.

Exhausted Dry Batteries Produce Flame Spectacle

In open fireplaces, especially where wood is used for fuel, a gorgeous colored-fire effect may be produced by placing one or two old dry cells among the hot coals. The substance with which the top of the battery is sealed soon burns away, and the heat sets up a chemical action, producing a gas which burns with a flame of vivid blue, purple, and green. One old dry cell will continue the spectacle for from a half to three quarters of an hour, depending upon the heat of the fire in which it is placed. No danger attaches to this production of colored fire. It costs nothing, inasmuch as old dry batteries are ordinarily worthless, but it will provide both pleasure and amusement at fireside gatherings.

Mending Broken Vases

When the lower part of a vase is broken, so that it will not stand, the vase is quite often thrown away as useless, because it is difficult to cement the base together so as to be strong enough to support the weight. Such a vase can be repaired quite strongly by imbedding the lower part in a new base made of Portland cement. The cover of a tin can is used to hold the cement, which is smoothed up around the vase to a graceful shape. After the new bottom is smoothed off and painted, the vase will be better than new as regards strength, and hardly less pleasing to the eye. Also, because of its weight, it is more stable than it was originally.

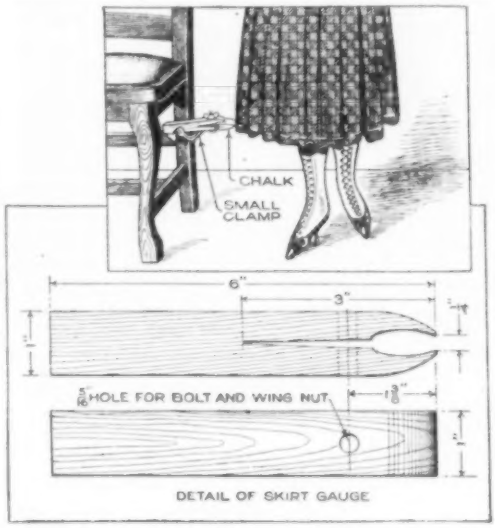


Uses for Old Gas Mantles

Old gas mantles crushed to powder make an excellent polish for jewelry. The fact is becoming quite well known, and the material is being bought and sold for this purpose. The material is also made use of by mantle manufacturers, as they can reclaim from it the rare earths which are used in the manufacture of mantles.—Robert Davidson, Albany, N. Y.

A Length Gauge and Marker for Ladies' Skirts

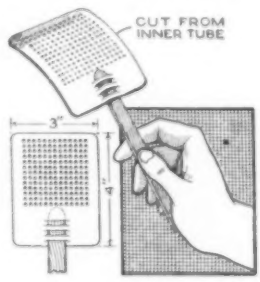
The gauge, or marker, shown in the illustration, is designed to be attached to the leg of a chair and to mark on a skirt the proper length for cutting. The instrument consists of a piece of chalk, held in a clamp made of hard wood, which in turn is attached to the leg of the chair by an ordinary C-clamp. The chalk may be held in the opening by using a ¼ by 1½-in. stove bolt with a wing nut.—Guy E. Waite, Ottawa, Ill.



A Marker Like This Makes It Easy to Cut a Skirt to a Uniform Length at All Points

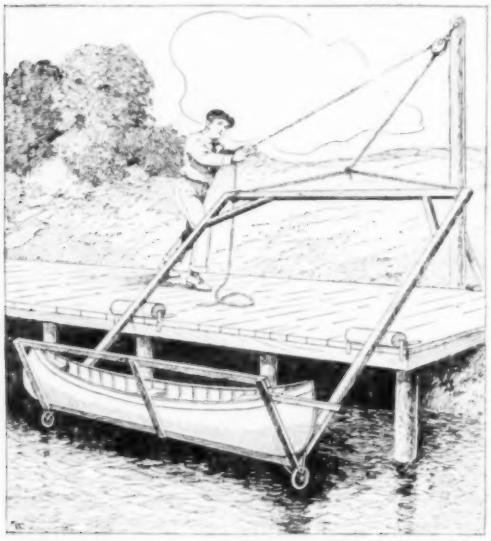
"Swat the Flies" with a Piece of Inner Tube

To make an efficient fly swatter, cut a piece of rubber, about 3 by 4 in., from an old inner tube. Make five parallel slits near one edge, into which the handle is secured by having alternate straps of the rubber on each side of the wood. Punch small holes in the rubber with a leather punch to make the swatter quiet and effective in action. This rubber fly swatter can be made by the children; it does not mar the furniture, or catch on the clothing or curtains.—W. S. Hoffman, Lind, Wash.



Handy Device for Lifting Boats Out of the Water

Lifting canoes and small boats out of the water and dragging them along some distance on their keels weakens them and



The Cradle Serves as Both Hoist and Truck for Small Boats

causes leaks, perhaps more than any other one thing. Carrying them is hard work, and demands the services of at least two men. The use of wooden rollers, on some docks, helps matters, but even these are not always satisfactory or convenient. In the case of a canoe or boat club, the distance it is necessary to haul the boats to their proper places when not in use increases in proportion to the membership of the club. Where there are 50 or 60 small boats owned by members, the farthest rack is frequently 20 or 30 yd. from the water's edge.

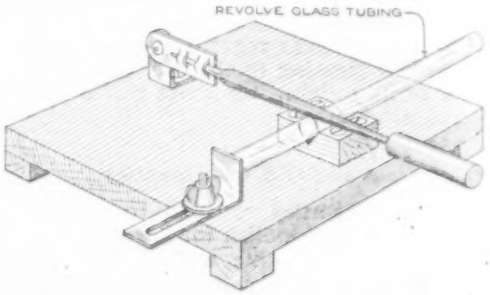
The lifting device illustrated, has been found to obviate these difficulties. It is a combined lifter and truck, for the lower part of the cradle is equipped with small cast-iron wheels for trundling along on the dock when the boat is out of the water. These may be set to run with the length or the width of the frame, or may be on swivel bearings. Canoes or ordinary rowboats can thus be handled by a single person with ease. The cradle slips into the water at the edge of the dock, and the boat is floated into it. Then, by a direct pull and lift, the boat is lifted entirely out of the water. Wooden rollers at the edge of the dock make the process easier. Once on the dock, the cradle becomes a truck.

Where boats of any considerable weight are to be handled, a rope tackle can be used for operating the cradle. A moderate amount of pull on the tackle will lift any of the larger rowboats out of the water, and pull them up on the dock. After that is done, one man can run them into any desired place, and likewise launch them by the opposite process.

The cradle is made of stout 2 by 4-in. sticks of hard wood. Its size and strength depends upon the weight of the boats to be handled. Its length should be about two-thirds that of the boats. Anything bigger than this makes it clumsy and awkward to handle. If the average length of the boats or canoes is 18 ft., a cradle 12 ft. long will answer all purposes. The depth of the cradle depends upon the height of the dock from the water's surface. If handled without a tackle, the upper part of the cradle should stand high enough above the edge of the dock for good leverage. Otherwise, one will find it impossible to tip it and draw the boat out of the water. It is a good plan always to install a tackle arrangement for emergencies. Even if as a rule only canoes or small boats are to be handled, larger craft may some day visit the club, and it will be necessary to lift them out. The advantage of this device is that it does not interfere with the landing of larger boats. It is portable, and can be removed at any time, or left standing at one side on the dock. When needed, it is a most convenient piece of equipment, and will save a great deal of hard work and trouble.—Geo. E. Walsh, New York, N. Y.

A Handy Glass-Tube Cutter

A glass-tube cutter which permits good work to be done easily and quickly, is



A Glass-Tube Cutter, Which Insures Uniformly Good Results, is Constructed from Easily Obtained Odds and Ends

made from a wooden V-block, a piece of board, an improvised hinged chuck, and

a small metal stop, or length gauge. The tang of the file is forced under the two straps of the hinged plate, these straps being made by slitting the metal with a chisel and bending it out.

To use the device, the tube is laid in the V-block, and the gauge set for length. By pressing lightly on the handle of the file, while revolving the tube, a circular cut is made that insures the easy breaking of the glass by tapping it next to the cut. To secure a clean break, either heat the glass at the score with a match, and then plunge it in water, or moisten the tube with turpentine, before scoring. When one edge of the file becomes worn, it can be turned so that a new edge is ready for use.—C. H. Willey, Concord, New Hampshire.

Beautiful Patterns Made by Sound Waves

As is well known, sound travels in the form of waves. It is not, of course, possible to see these waves, but it is easy to secure a record of their effects. An easily made device may be employed for the purpose, and with one of these, patterns can be made with the voice. The construction of such an instrument presents no difficulties at all and, in fact, is a diverting toy of great scientific interest.

The first thing required will be a tin saucepan with a hollow handle. Also, a small tin funnel should be secured, the narrow end of which is a little smaller than the handle of the saucepan. Buy a piece of sheet rubber just big enough to stretch over the top of the saucepan. Then, with a little twine, one will have all that is necessary for the making of the toy.

First of all, remove the end piece of tin on the handle of the saucepan. Push the small end of the funnel right down inside the handle. Then bore a hole inside the saucepan just where the handle is fixed. Make this opening as wide as the inside diameter of the handle, so that there is an opening right through the funnel and handle. Next, stretch the piece of sheet rubber across the top of the saucepan, using string to tie it around the sides.

To show the effects of the sound waves, get some very fine powder. Ordinary flour, if really fine, is good, but the finest chalk, known as "precipitated," is better. Druggists sell lycopodium powder, which is well adapted to the purpose.

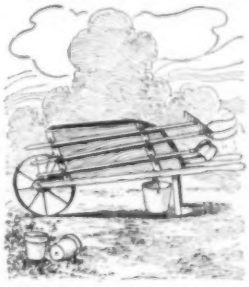
To use the device, sprinkle a little of the light powder on the piece of rubber. Then start singing into the funnel, sounding the same note steadily. The tiny bits of dust will start to move about. After

An Interesting Toy, Which Operates on Scientific Principles, Makes Patterns in Chalk or Powder When a Note is Sung into the Mouthpiece

a while, they settle down into quite a pretty pattern. The patterns will vary according to the kind of powder used and the note sounded.—S. Leonard Bastin, Bournemouth, Eng.

Converting the Wheelbarrow into a Garden Truck

The amateur gardener should save himself as many steps as possible in his work, since his hours are few and every step counts. The wheelbarrow can be made to save his time and energy by adding racks on the sides, as shown, to carry cultivating tools. Make three sets of iron hooks for each side of the wheelbarrow and screw them to the edges of the dash and to the upright cleat of each sideboard. A hook under the flooring can be used to carry a bucket or extra sack. By fitting an arrow-shaped iron to one leg of the wheelbarrow, it can be utilized to furrow, mark, or cultivate, according to the angle at which it is adjusted. Garden tools can be laid in the hooks, seed or water carried in the bucket hung underneath, and the body of the wheelbarrow filled with dressing. The rack will be as useful in harvest time as it is when planting.—L. B. Robbins, Harwich, Mass.

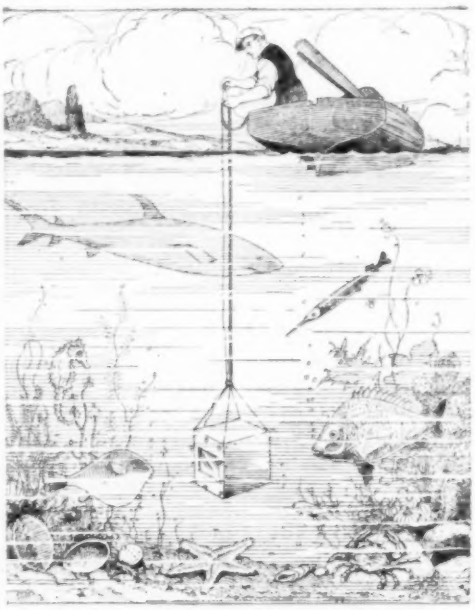


Taking Submarine Photographs with an Ordinary Camera

By JOHN EDWIN HOGG

A DELIGHTFUL pastime as well as an educational one, which may be enjoyed by any boy of average mechanical ability, is that of taking pictures under water with an ordinary camera. It is only necessary to construct a water-tight box with a plate-glass front in which to house the instrument. This is but the work of a few hours, after which all the submarine mysteries of the near-by lake, stream, or ocean may be explored photographically. Aquatic plants may be studied from the fishes' viewpoint, and indeed the fishes themselves are easily baited in front of the camera for close-range views.

Let us suppose, for instance, that the camera to be used is one of the folding type, taking post-card-size pictures. This is a standard variety and lends itself well to submarine adaptation. For housing such an instrument, the water-tight box will need to be 10 in. high, 6½ in. wide, and 8¾ in. deep, inside measurements. It is best constructed from ⅜-in. material, preferably spruce or maple, and care should be used to select wood that is free from defects. The sides are cut 8¾ by 11⅝ in., the top and bottom 6½ by 8¾ in., and the front and back 8⅛ by 11⅝ in. Both sides of this box will lap over the edges of the top and bottom members. The back will attach to lap over the sides, top, and bottom, and the front will lap over the four, making a detachable lid to permit the installation of the camera and its ready removal. The whole is put together with wood screws, placed every 1½ in. along the overlapping edges, with a brass washer under the head of each screw. Holes for the screws should be drilled to avoid danger of splitting the wood. Strips of felt, which may be cut from an old hat, should be coated with white lead and placed between the boards to serve as calking.

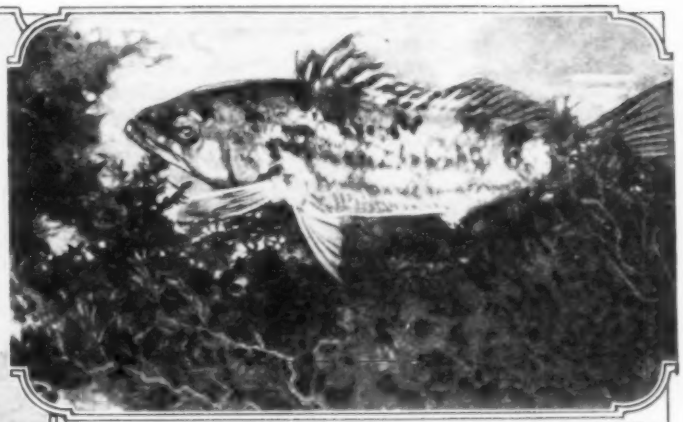


Some of the Fish Photographed by the Author are Here Shown, as Well as a Suggested Method of Using the Camera

The lid is attached by means of 10 headless machine screws, set in the body of the box, as shown in the drawing. Wing nuts are used to make the lid quickly detachable. A water-tight joint is obtained between the lid and the body of the box by the use of heavy rubber gaskets. These are made from ordinary washer rubber, such as is obtainable at a plumbing shop. The surfaces of both the lid and the edges of the box against which it fits must be planed true, and then the gaskets are cemented to the lid and box with a coat of shellac. Care should be used in locating the holes in the gaskets through which the screws are to pass.

In taking underwater pictures, it will be found convenient to use films having 10 exposures to the roll. It would be annoying if the camera had to be removed from the box after each picture, so provision is made, in the form of simple water-tight fitments, by which the shutter is operated while under water, the focus may be adjusted, and the films turned up after each exposure without removing the lid from the box. Of course, if a camera of the universal-focus type is used, the construction of the box is rendered less complicated.

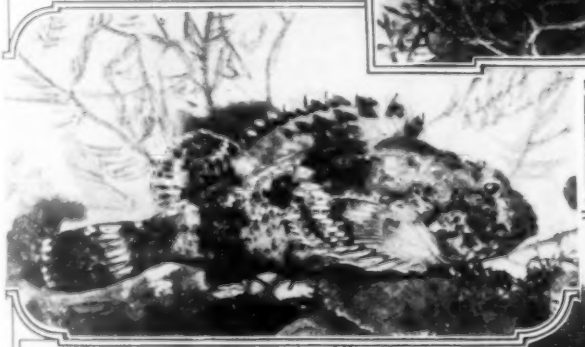
The focusing mechanism, as shown in the assembly, Fig. 1, and detail, Fig. 2, was made from a small steam gate valve, which had outlived its usefulness as such. It was purchased from a steamfitter's shop for the value of its weight as old brass. After the opening has been cut in the lid for the glass, the camera is fitted into the box, and work is started on the focusing mechanism. The steam valve, which is designed to be steam-tight around the stem, should, of course, be water-tight. The base of the valve is screwed into a brass plate, ⅛ in. thick, and soldered to the plate. The whole is then fitted into the lid, as shown, and the focusing slide of the camera is connected with the stem of the



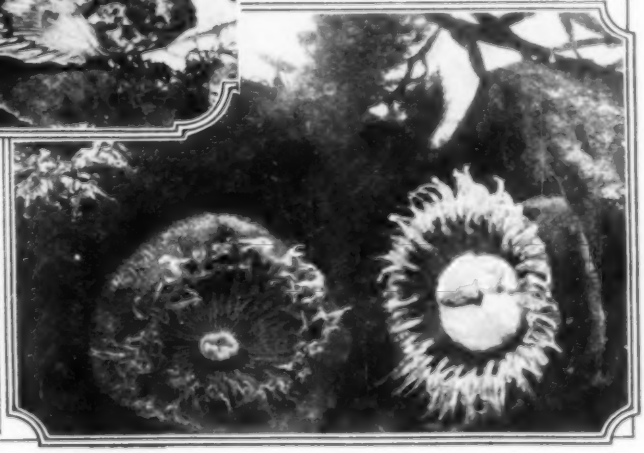
The Large Specimen of Striped Sea Bass Above was Photographed in One of His Feeding Grounds. He is Usually Found near Kelp Beds, or Other Varieties of Sea Vegetation

Diving for Photographs of the Sea Bottom, with Its Strange Rock Formations and Its Stranger Life Forms, Is Far Greater Sport Than the Usual One of Diving for Pennies or Pebbles

Even at a Distance of 12 Feet below the Surface the Camera Secures Excellent Family-Group Pictures, Such as the Above, Which Shows Perch Swimming through Seaweed



The Four-Pound Sculpin, Seen Above, was Snapped While Swimming in His Favorite Haunts, Close to the Sea Bottom. He Prefers a Depth of from 8 to 20 Feet



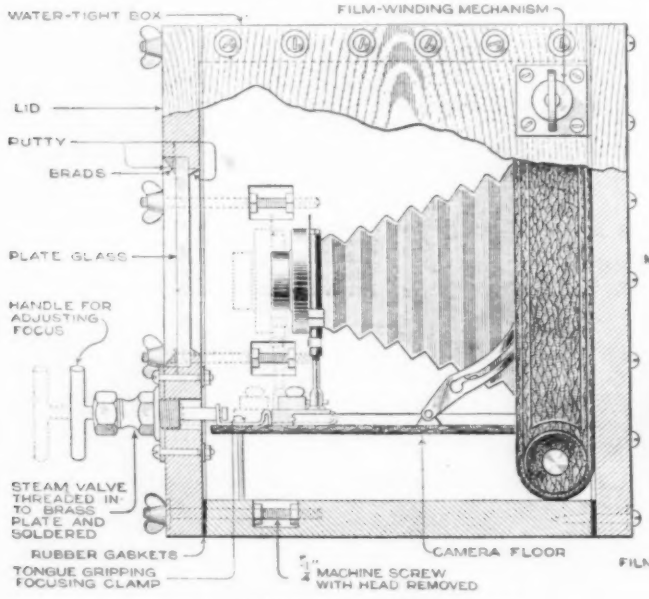
The Sea Anemones, on the Right, with Their Background of Sea Growths, and of Slimy-Colored Rocks, were Photographed 10 Feet below the Surface on the Pacific Coast

valve by means of a brass tongue, fashioned from a narrow strip of metal. The end of this tongue is bent upward to form a right angle, and is slotted to fit into a groove near the end of the valve stem. After being fitted to the stem, a tiny strip of brass may be soldered across the top of the slot in the tongue to hold it permanently in place. The rear end of the tongue should grip the focusing clamp in some such manner as shown in Fig. 1, so that the entire rack, shutter, lens, and bellows can be moved back and forth by turning the valve handle. Turning the steam valve inward serves to focus the camera for distance by compressing the bellows, while turning the valve outward gives the focus for close-up work.

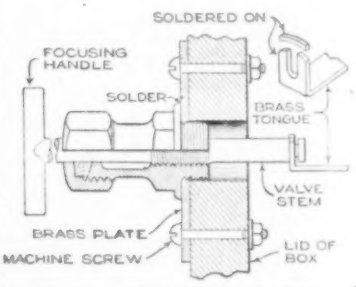
The fittings for the shutter-operating mechanism and the device for winding up the films are combinations of ¼-in. brass bolts and automobile gasoline-line connections. For the film winder, the nipple of a gasoline union is sawed off and threaded into a hole in the center of a brass plate, 2½ in. long, 2½ in. wide, and ⅛ in. thick, as shown in Fig. 3. After being screwed down into the plate as far as it will go, the nipple is soldered on

3/16-in. machine screws, by which the whole is fastened in the proper position on the side of the box. The hole in the side of the box, through which the shaft will pass, will need to be slightly counterbored so the protruding portion of the nipple under the base plate will fit correctly into the wood. A coat of white lead is applied underneath the plate, around the screws, and in the screw holes, before the nuts are tightened down on the washers inside the box. The bolt to form the shaft is trimmed off to the correct length before being installed; it should have a wing handle soldered to the outer end of it for convenience in turning. The film winder engages the camera member by means of a brass claw which is attached to the inner end of the shaft by means of a cotter pin set through a square nut.

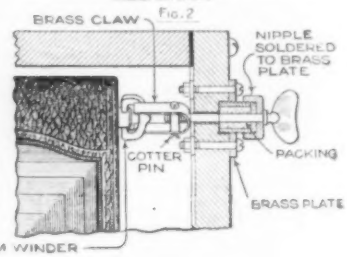
The mechanism for operating the shutter is similar, as shown in Fig. 4, but it will have a 2-in. arm which is pinned to the end of the shaft. The free end of this arm should have a small hole drilled in it to take the silk fish cord used to operate the shutter when the box is lowered into the water. A water-tight



SIDE VIEW OF WATERPROOF BOX
Fig. 1



DETAIL OF STEAM VALVE FOCUSING MECHANISM
Fig. 2



FILM-WINDING MECHANISM
Fig. 3

A Common Folding Camera is Mounted in a Water-Tight Box, in Which are Set Windows and Stuffing Boxes. Through These the Camera Mechanism is Observed and Controlled. The Cover is Removed When Necessary to Insert a New Film

both sides to insure an absolutely water-tight joint. Four holes are then drilled around the edge of each plate, to take

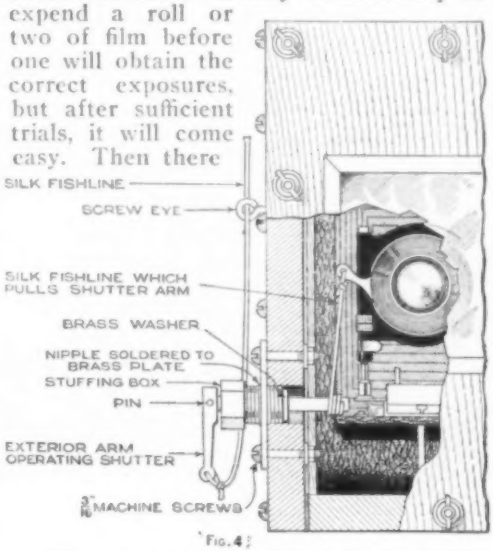
joint is secured in both fitments by partly filling the union nuts with greased packing before they are tightened down on

the nipples. This forms a neat little stuffing box similar to the larger ones used on the shafts of motorboats. If the outfit is to be used in fresh water, all the metal fittings may be of iron or steel. For salt water, brass or bronze must be used, inasmuch as steel or iron would be quickly ruined by rust and corrosion.

In order that the focusing table of the camera may be seen without removing the lid, a small window must be made on that side of the box. This window should be 2½ in. long by 2 in. wide. It is made the same as is shown in the drawing for fitting the glass in the lid. Still another small window must be made in the back of the box for observing the indicator of the camera, showing the position and numbers of the films as they are turned into position for the various exposures. These windows are not shown in the drawings, as they are made similar to the large one shown in Fig. 1.

The finished box should be given three or four coats of shellac, which should be carefully worked into the cracks to insure water-tight joints. Each coat should be thoroughly dry before applying the next, and when the last coat has dried, at least two, or even three, coats of good marine paint should be put on. The paint should cover the putty around the windows and lap over slightly onto the glass. The box will have to be weighted to make it sink, and before trying the camera out in it, it should be tested for leakage under 15 or 20 ft. of water.

A sunny day will be necessary for taking submarine pictures. The light is considerably weakened under water, so the largest opening of the shutter diaphragm should be used. It may be necessary to expend a roll or two of film before one will obtain the correct exposures, but after sufficient trials, it will come easy. Then there is almost no limit to the educational enjoyment that may be had by delving into the submarine wonders that are at present practically an unexplored field to the photographer.



The Camera Shutter is Operated by Pulling on a String, Which Operates an Arm Mounted in a Small Stuffing Box

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¶ Stove polish is a good substitute for the paint used to keep auto rims from rusting.

Match Safe Made from Nutmeg Grater

A nutmeg grater, which has become too dull for usefulness for its original purpose, makes a spendid match safe. The grater is hung up by the hole or handle on the larger end, the bottom of the nutmeg pocket is taken out, and a wooden plug is driven in, leaving a sufficient height above it for the matches to come just under the lid of the nutmeg pocket. If the rough surface is too dull for good grating, it is just right for striking matches.

To Prevent Sparks Setting Fire to Tents

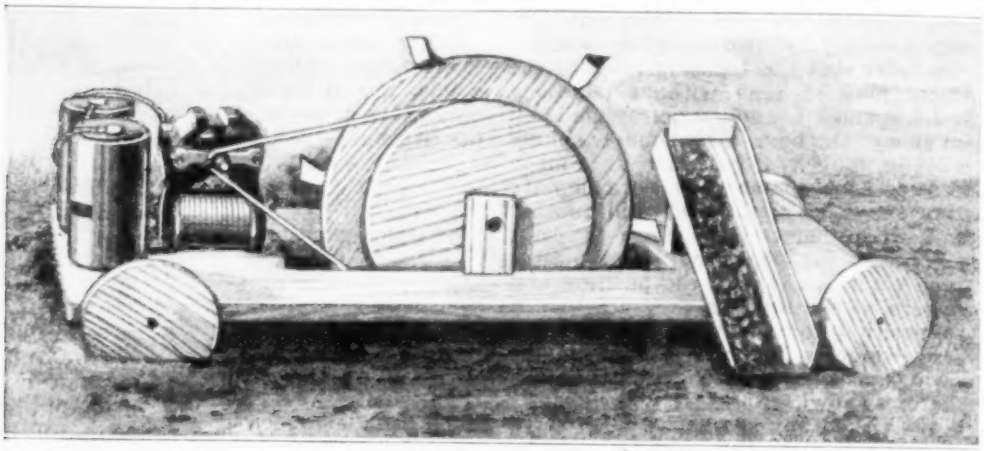
Where ordinary stovepipe is used for a chimney in a tent, there is danger from fire, due to the flying sparks. The method described has helped to avoid this danger in many cases. The process consists in punching ¼-in. holes around the pipe, in a circle about 6 in. below the top. These holes allow a counter draft to enter the chimney. Instead of the red-hot sparks being blown out over the tent roof, they only go up as far as the holes, where they circulate until cool, when they fall again, unless the draft is too strong.—W. L. Goodwin, Seattle, Wash.

Cork-Tipped Chair Legs Preserve Polished Floors

Polished floors may be saved from the wear which is due to chair legs by fitting the ends of the legs with cork disks. These may be made by splicing up a large cork bottle stopper with a sharp knife, and should be glued very firmly to the ends of the chair legs. Any unevenness in the length of the leg can also be remedied by using a cork disk of the proper thickness.—R. E. Wismer, Ontario, Can.

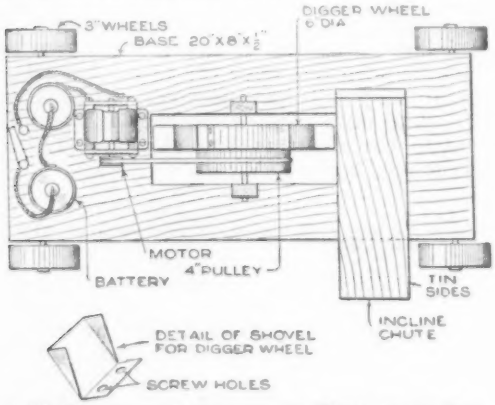
A Model Trench-Digger Toy

The photograph shows a model trench digger made by an enterprising youngster. When the motor is running, the digger cuts a smooth trench in loose soil, the toy being pushed or pulled ahead by the owner.



The Finished Toy Resembles the Powerful Machines Which were Used to Dig Trenches on the Battle Fields of Europe during the World War

On a base, 20 in. long, 8 in. wide, and ½ in. thick, four wooden wheels, 3 in. in diameter and 1 in. thick, are fastened. The digger wheel, 6 in. in diameter and 1 in. thick, is mounted on a shaft made from a large spike. On the same shaft, and nailed to the digger wheel, is a pulley 4 in. in diameter and 1 in. thick. The pulley has a groove cut in the circumference for the belt to run in. The shaft



A Model Trench Digger can be Made by the Boy Himself if He Owns a Toy Motor and can Obtain Two Battery Cells from a Tubular Flashlight

with the two wheels is mounted on two uprights, one on each side of an oblong hole, 8 in. long and 4 in. wide, cut in the base. The uprights should be 3 in. high, and the shaft should rest in holes bored in them, 2 in. above the baseboard. A small toy motor is screwed to the base, so that the pulley of the motor will be in line with the pulley on the digger wheel. Two dry cells, such as found in tubular flashlight batteries, are fastened to the base with straps, and connected to the motor in series with a small battery switch. For the shovels, sheet tin is cut and bent to the form shown in the drawing. Six of these will be required, each fastened to the digger with two small screws. The chute, which is to carry the dirt away as it is dug, is a piece of board, 2½ in. wide and 10 in. long, with narrow strips of tin tacked to the sides. It is mounted on a small block, so that the digger wheel will drop the dirt into the upper end of the chute when the motor is running. The completed digger may be painted, or not, as the maker pleases.—F. E. Brimmer, Syracuse, N. Y.

Uses for Old Phonograph Records

Old disk-phonograph records, which are not chipped or otherwise broken, can be used for other purposes than reproducing music, and thus a longer lease on useful life is gained.

Several of them of the same size, when clamped together with a steel spindle passed through the holes, will make a serviceable pulley for light-power transmission.

Small sections of a record, cut out with a fine hacksaw, and placed around the house, make good match scratchers.

Basket weavers will find the smooth

surfaces of single-face records well suited for use as bottoms for fancy trays. They take a high polish, and, when shellacked, shine like glass.

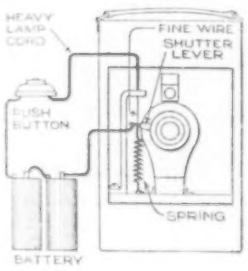
The small 6-in. records make good wheels for toy carts for children; the modern disk record is quite tough, and will stand considerable banging around.

A Drummer's Practice Pad

A student drummer devised a practice pad from discarded rubber heels, by cutting them square, and attaching them to a wooden base. While possessing all the resiliency and elasticity of the regular drumhead, this pad is practically "silent" in comparison with the customary calfskin head.

Camera Shutter Operated by Electric Fuse

A camera shutter operated by electricity enables the photographer to get into the picture. No electromagnets are used in the method described. Secure a spring, or rubber band, to the shutter lever, and put enough tension on it so that when released, it will operate the shutter positively. Then, on an insulated support, connect a short piece of one-ampere fuse wire, or No. 36 gauge copper wire, so that it holds the lever in position to keep the shutter closed, in spite of the tension of the spring, which tends to open the shutter. Connect this fine wire in series with a push button, and one or two new dry cells by a length of heavy lamp cord, as shown in the diagram. When ready to snap the picture, push the button. The current burns out the fine wire, thus permitting the spring to operate the shutter. It is easily reset by inserting a new fuse.—V. H. Todd, Orange, N. J.

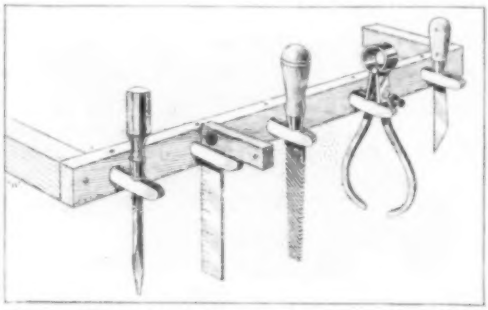


Preserving Rubber Fruit-Jar Rings

It has been found by a packing company that rubber fruit-jar rings will give better service if they are given a coat of glycerin before being used. Rubber rings so coated can be preserved much longer than their normal period of usefulness.

Tool Rack Made from Clothespins

A clothespin tool rack is very easy to construct, being made from a strip of 1 by 2-in. lumber and some old-fashioned wooden clothespins. A series of holes, the size of the pin body, are bored in the strip, and into each hole a clothespin is driven until the legs project from one side. Then the pins are secured in place by driving a wire brad down through them.



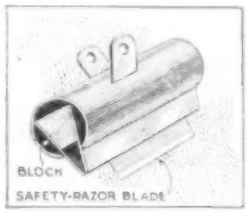
Racks Made from Clothespins Provide a Quick Addition to Space for Keeping Tools

Sulphur as a Cement

Ordinary powdered sulphur, or "flowers of sulphur," makes a good cement for some kinds of material. If the hole in an umbrella handle is filled with powdered sulphur, and the iron rod of the umbrella, heated red-hot, is inserted into the hole, the heat will melt the sulphur, and the rod will be held quite solidly when the sulphur has cooled.

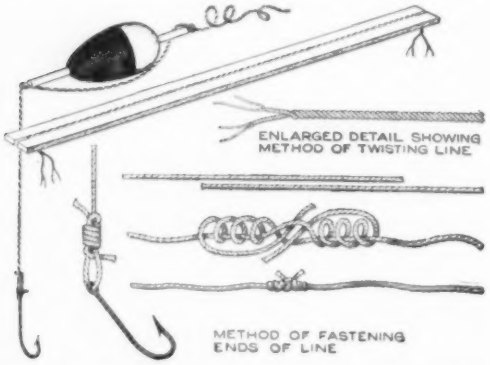
Paper Clip Serves as Handle for Razor Blade

Old safety-razor blades are handy for sharpening pencils, ripping stitches, cutting paper, opening letters, etc. They are difficult to hold in the hand without some sort of protection. For this purpose a small paper or bill clip will prove most satisfactory, as it forms a handle which holds the blade quite firmly, provided a clip with a strong spring is used. If such a clip is too deep, a block of wood placed between the blades of the clip will be of assistance.—Mrs. Grace E. Willey, Concord, N. H.



A Horsehair Fishing Line

A very fine fishing line that will never rot, that is strong, and, if made of white hair, practically invisible in the water, can be easily and cheaply made, the only



A Horsehair Fishline, Which is Easily Made, Has the Advantage of Not Rotting

materials required being a few strands of hair from a horse's tail. First, select two long, stout hairs, and hold one end. After placing them together, twist them by rolling the free ends under the palm of the hand, over the leg. When twisted, take a stick (a ruler will do very nicely) and place the ends of the twisted strand in slits cut in the ends of the ruler. This prevents the strand from unrolling while another strand is being twisted in the same way. Now, place the two twisted strands together and let them partly untwist, to form one strand of four single hairs. Soap the ends as a string is waxed. Fasten it in the slits of the ruler, and proceed to make more strands, until there are sufficient for the length of line required.

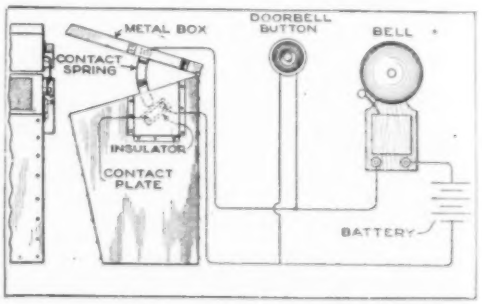
To fasten the ends securely, place the ends of two strands side by side, as in the illustration; hold the end of one strand and wrap it three or four times around the end of the other strand; bring the end back and push it through the space between the strands. Wrap the end of the other strand similarly around the end of the first strand, but in the opposite direction; bring the end back as before, and push it through the same opening but from the opposite side. Now, hold the knot so formed between the finger and thumb of the left hand, and pull it into the final shape shown. Then clip off the ends. This forms a very neat knot which will not become undone. The ends will not show to any extent if the knot is well made. Fasten a bob and hook on, as shown, completing a very good line, which will not rot and which is very strong. Three or more single hairs may be used to form each individual strand, thereby making as strong a line as needed.—Robt. C. Knox, Rogers, Ark.

Hose Cleans Out Cookstove

When a cookstove becomes filled with soot, take it down and remove it to the back yard. Flush it out with water from a hose, which will remove the soot very quickly. Then set the stove in place again and at once build a fire to evaporate the water remaining in the stove and prevent it from rusting.—Mrs. B. N. Hames, Marietta, Ga.

Mail Box Rings Electric Bell When Opened

For people who live on rural routes, a simple electric-bell circuit saves much time and trouble by indicating when the mail box is opened to deposit mail. All that is necessary is an ordinary battery-and-bell circuit, connected to a device on the mail box which causes a spring to make contact once as the lid is opened, and again as it is closed. The contact must be long enough to ring the bell plainly; the use of a spring of the shape shown will have this effect. Unless the mail box is sheltered from the weather, a tin protector must be soldered to the box around the contactor, and the cap soldered to the top of the mail box. The addition of a button to the bell circuit provides for a doorbell also. If an electric doorbell is already installed, all that is necessary is to add the contactor and its connecting wires. Rings from the



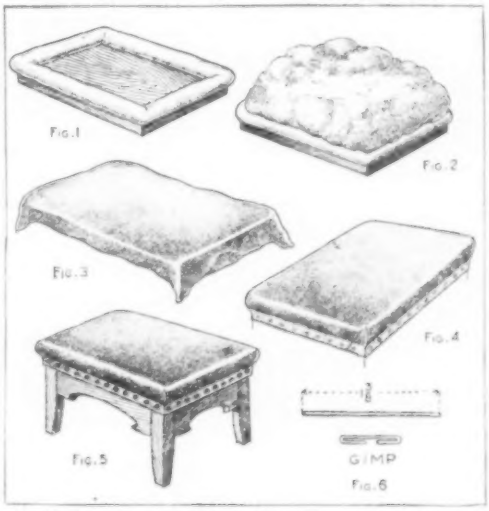
A Contactor Mounted on the Mail Box, Used in Connection with the Doorbell, Provides a Simple Signal Indicating the Delivery of Mail

two sources are easily distinguished when one becomes familiar with the sound of the two rings indicating mail.—Ed. H. Hauenstein, Wooster, Ohio.

Worn-Out Chair and Tabouret Make Upholstered Footstool

AN old upholstered easy chair, with the curled hair oozing from various rents in the covering, and a badly bruised and shabby tabouret with a wooden top, suggested the possibility of converting the tabouret into a foot rest. The chair was relieved of all the curled hair it contained, which was then carefully beaten to remove the dust. As the legs of the tabouret were too long for a foot rest, they were sawed off and tapered on the inside. A piece of cotton drilling was cut about 7 in. wide, and long enough to reach around the top of the foot rest, with 6 in. added for good measure. Some of the curled hair was rolled into this strip and made into a hard roll, about 2 in. in diameter; this was tacked around the edge of the top of the foot rest, as in Fig. 1, to give a firm and uniform edge to the cushion, which would not push in and allow the wooden top to cut through the covering. The lumps were carefully worked out of the remaining hair, and a pile built up as in Fig. 2. A piece of cotton cloth, about 6 in. larger each way than the top of the foot rest, was drawn tightly over the top, as shown in Fig. 3. The filling was carefully packed down in the center, and the lumps worked out with a smooth flat stick, working in from the ends to make the cushion as hard and as flat as possible, to make sure that the corners would be square, and nearly the same height as the rest of the cushion. This forced the edge roll firmly against the filling, and the ends of the cloth were brought down and tacked as in Fig. 4, the corners being built out before the last tacks were driven, and care being used to preserve the form of the edge. The cloth was folded under upon the long side and the corner made as nearly straight up and down as possible.

A piece of brown imitation leather was purchased for the covering, and tacked



A Useful and Attractive Upholstered Footstool can be Made from Two Pieces of Worn-Out Furniture

on, the fold of the corners being at the ends to avoid the thickness which would result if the cover had been folded the same way as the cloth of the under cover. A strip of the covering, 1⅜ in. wide and long enough to go around the top, was folded, as indicated in Fig. 6, for a gimp, or binding, and nailed in place with brown upholsterer's nails which matched the covering. The legs and rails were sandpapered, given a coat of brown stain, and waxed. Thus one piece of useful furniture was made from two pieces which were of no value.

A Watch Charm for the Draftsman

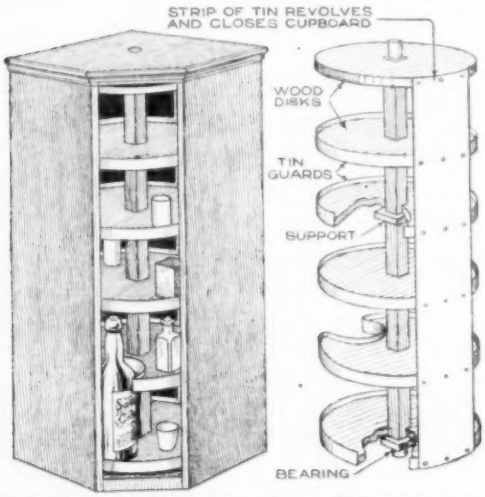
A watch charm symbolic of the wearer's occupation is universally prized. The one described can be easily made by the draftsman, and will present a neat appearance. The next time a corner is broken from a celluloid triangle, file the broken edge of the small piece straight to form a smaller triangle, cutting out the center by drilling a hole and filing to shape. A small hole should be drilled in one angle so that the charm may be hung on the watch chain. The triangle may be left plain, or, if preferred, may be roughened up with fine sandpaper, and colored with India ink.

To Keep Flowers from Wilting

The life of cut flowers may be lengthened considerably by dipping their stems into melted candle wax, after they have been in water for several hours. When a small knob of wax has formed on the end of the stem, it will keep them from wilting for some time, even if kept out of water after treatment.

A Cupboard with Revolving Shelves

Corners are often made useful by having shelves or cupboards built in them. They may be made still more useful, and



A Cupboard with Revolving Shelves Makes a Roomy, Accessible Piece of Furniture Which can be Placed in the Corner, Out of the Way

more attractive, if the cupboard installed has revolving shelves, for in that case the shelves may be larger, without increasing the difficulty of reaching an object. The dimensions can be made to fit the room. A number of wooden disks are mounted on a vertical axle, being supported by small wooden cleats. Around the circumference of each shelf is tacked a strip of tin, to keep the articles on the shelf from falling off when the shaft is revolved. A strip of tin, a little wider than the opening in the case, is nailed to one side of the shelves to close the opening. The case may be made of any wood, finished in a simple varnish stain. The shaft upon which the shelves are supported fits into holes bored in the top and bottom of the case.—Dale R. Van Horn, North Loup, Nebraska.

Preventing Frayed Negatives

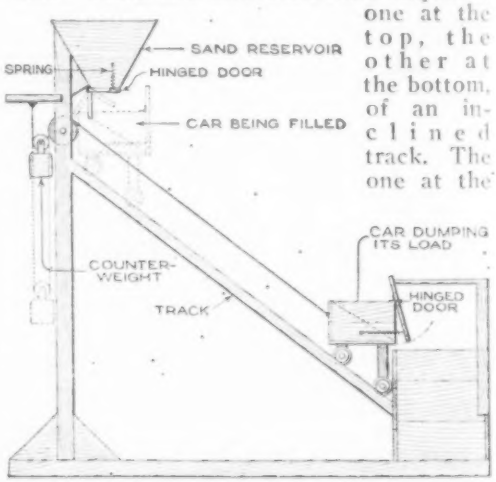
When developing plates, especially in hot weather, nearly every photographer has his difficulties with frayed negatives —that is, having the emulsion split away from the glass and become frayed or ragged along the edges. Often the resulting pictures are thus ruined. This may be avoided, in most cases, by rubbing the edges of each plate with tallow or paraffin, such as a candle affords, before it is dropped into the developer. The coating of wax or tallow thus deposited, seals the emulsion to the glass. It prevents the chemicals from working in between the emulsion and the glass, doing away with frayed edges and blisters of the emulsion. This remedy will be found effective even in very warm weather, when ice in the developing solution is not available. Its value to the photographer will be in proportion to his normal losses from frayed or blistered negatives.

Rubber Stamps Cut from Squeegees

Men in the naval service have occupied some of their spare time cutting rubber stamps to print their names, from pieces of worn-out squeegees or window cleaners. A portion of the wooden part of the squeegee is cut out with the section of rubber, and, when carved to a convenient shape, becomes a mounting for the rubber stamp. Large letters are used, since they are easier to cut.

Automatic Sand-Hoist Toy

A toy which automatically takes sand from one reservoir and places it in another is interesting to make, and pleases boys who like to "see the wheels go 'round." Since the dimensions can be changed to suit the builder, only the principle upon which the toy operates is given, the dimensions being easily worked out. There are two reservoirs required, one at the top, the other at the bottom, of an inclined track. The one at the top has a hinged bottom, held in place by a spring or rubber band until a piece fastened to it is pushed by the car, when



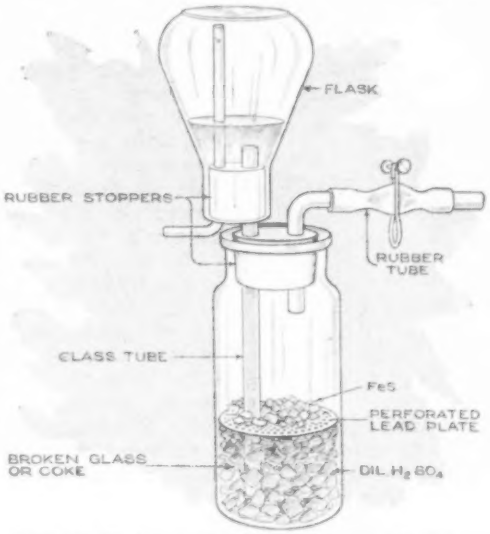
An Automatic Sand-Hoist Toy Loads and Dumps a Car as Long as There Is Sand in the Upper Reservoir

it opens and dumps sand into the car. When the car with its load is heavier than the counterweight, it will slide down the track. As soon as the trigger on the bottom of the upper reservoir is released, the spring or rubber band pulls the bottom up. When the car reaches the bottom of the track, it bumps into a stick which presses back on the upper part of the hinged car front, opens it, and allows the load to slide out. This hinged front is kept shut by a spring, or rubber band, except when opened by the bumper on the lower reservoir. When it is empty, the counterweight, which is heavier than the empty car and lighter than the full car, pulls it back up the track. The car has a slanting bottom to make the sand slide out easily. When properly built, the toy will automatically load and dump the car as long as there is sand in the upper reservoir. The toy will furnish many hours of pleasure to the boy who takes the pains to make it.

A Hydrogen-Sulphide Generator

The amateur's laboratory need not be without an automatic hydrogen-sulphide generator, the one illustrated being simple and quickly put together. A two-hole rubber stopper in the wide mouth of a gas bottle is provided with two glass tubes. One is a long straight tube, extending from the bottom of the bottle up through the stopper and into another two-hole stopper in the neck of a flask. A short, right-angled glass tube from the second hole in the gas-bottle stopper is connected to a glass delivery tube by a piece of rubber tubing, upon which there is a pinchcock clamp. The bottom of the large bottle is filled with broken glass or coke, and on it rests a perforated plate of sheet lead. On top of this plate is a small quantity of ferrous sulphide (FeS). A tube with a right-angle bend extends from the bottom of the flask, through the second hole in the stopper.

When the sulphuric acid (H_2SO_4) comes into contact with the ferrous sulphide, it liberates hydrogen-sulphide gas (H_2S), which may be collected by means of a pneumatic trough, or in any other convenient way. When the pinchcock on the rubber tube is closed, preventing the escape of the gas, this creates pressure in the bottle, forcing the sulphuric acid down in the bottle, out of contact with the sulphide, and up into the flask. This stops the generation of the gas. When the pinchcock is released, allowing the gas to escape, the pressure in the bottle is diminished so that the sulphuric acid is allowed to flow, again reaching the

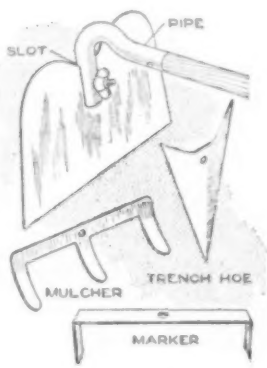


A Simple Hydrogen-Sulphide Generator, Which can be Put Together in the Amateur Laboratory, Is Automatic in Action

sulphide and thus generating more gas. Since the action is automatic, it is well to leave the pinchcock closed while changing the bottles in which the gas is collected. —Edw. H. Fackenthal, Easton, Pa.

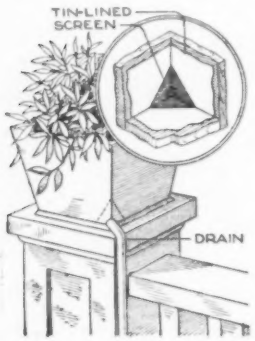
Homemade Repair on Hoe Serves as Combination Tool

When one gardener had the misfortune to break his hoe just back of the blade, the ingenious way in which he repaired it made it into a tool more useful than before. He bent a piece of pipe to the shape shown, fastened the handle firmly with a pin, drilled another hole, sawed a slot, and fastened the blade with a bolt and wing nut. Blades were then made of various shapes, any one of which could be fastened in the same slot in the piece of pipe. Thus one tool did the work of three or four.—Elmer O. Tetzlaff, Cicero, Ill.



Nonrotting Flower Box for Porch Post

The home mechanic is often called upon to build flower boxes to place on top of newel posts, and other porch columns. To prevent rot and to maintain a good appearance, it is best to drain the flower box, as shown in the picture. The box is lined for a part of its depth with tin or zinc, and drained through a 1-in. tube to the down spout, or over the edge of the porch. A triangular piece of window screen placed over the drain opening will prevent clogging of the pipe.—George L. Furse, St. Louis, Mo.

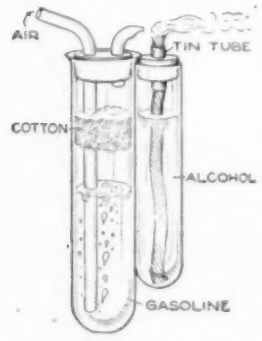


Stovepipe Makes the Bird House Cat-Proof

Many persons set a bird house on a tall pole in the garden. To protect the tenants, cut a piece of stovepipe open, and tack it around the pole about 6 ft. from the ground. Cats will be unable to climb past the pipe, because their claws will not catch on the metal.—Sylvanus Van Aken, Port Ewen, N. Y.

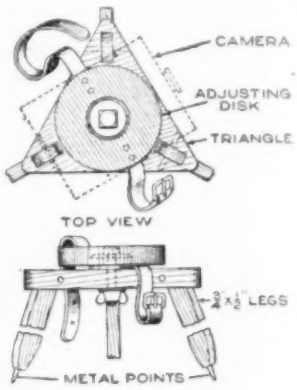
An Improvised Blowtorch

A chemist, having use for a more intense flame than the apparatus in his small laboratory afforded, constructed a blowtorch from materials at hand. As shown in the illustration, one test tube, of a suitable size, was half filled with gasoline, and was stoppered with a two-hole rubber cork, in one hole of which was a glass tube, passing through a wad of cotton, and extending to the bottom of the test tube. Through the other hole was a tube terminating in a jet, and bent, as shown. A smaller test tube was fastened to the first with tire tape, and fitted with a wick, passing through a tin collar placed in the cork. This tube contained alcohol. As the air was blown through the mouth tube, it passed through the gasoline, and gasoline vapor was blown across the alcohol flame, where it ignited and produced a very intense heat. A moth ball (naphthalene) dissolved in the gasoline greatly increased the resultant heat.—Raymond D. Harris, Opportunity, Wash.



A Tripod for Small Cameras

The great majority of photographs taken by amateurs do not, of course, require time exposures, and, for snapshots, it is entirely satisfactory to hold the camera in the hand. Quite often a tripod comes in very handy, but the high price of those to be found on the market often prevents the amateur from owning one.



The sketch shows a tripod which will take any kind of camera, either the box or folding type, which has a flat bottom on which to rest. The camera is held by the leather strap to the revolving disk, which can be clamped in place by means of the wing nut below. The disk is mounted on a triangular piece of wood, 1 in. thick, in which three slots have been chiseled out, to take the three legs. These should be about 4 ft. long and may have iron rods clamped along them, in order to vary the length, if desired. The tripod will, however, be found quite useful without this feature. The legs are prevented from swinging out too far by coming against the wood of the triangle, and if a stronger fastening is desired, all three may be tied together with twine.

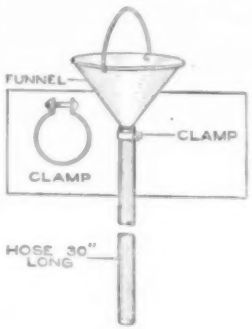
Screws Started in Inaccessible Places with Wooden Stick

A simple kink for starting a screw in an awkward place is to whittle out a piece of wood so that it can just be driven into the slot of the screw. If the slot is clean and of a standard depth, the stick can be made to fit tightly enough to hold the screw

while it is being started into the hole. As soon as the screw is turned hard enough to test the strength of the wooden stick, it can be pulled out, and an ordinary screwdriver used to force the screw home. —H. S. Hart, Shreveport, La.

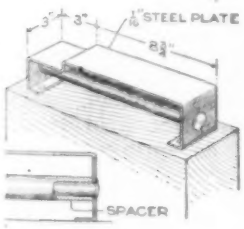
Bean Planter Saves Stooping

The planting of beans and corn is tiresome work, as there is much stooping required. Since it is impossible to stand upright and drop the seed accurately by hand, the planter described will prove of service. A funnel, large enough to allow the beans, or corn, to pass through it, and a piece of old garden hose are required. The funnel is fastened to the hose with a clamp, as shown. A wire handle may be added. To use the device, stand beside the row with the end of the hose about an inch from the bottom of the seed trench. Drop the seeds one at a time in the funnel, moving the planter the distance required to space the seeds. This planter allows the one using it to walk upright and at the same time drop the seed accurately, thus accomplishing the work more easily and in less time.—George Perkins, Millburn, N. J.



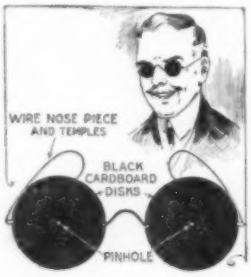
Simple Iron Foot Rest for Shoe Polishing

A metal rest for the foot while polishing shoes can be made from a piece of sheet iron, 2 or 3 in. wide, a piece of pipe, and a rod which fits inside of it. The sheet iron is bent to the shape shown, holes are drilled and countersunk in the ends, just large enough to take the iron rod, and it is inserted with the pipe as a spacer. The ends of the rod are riveted into the countersunk holes and the foot rest is complete. It can be mounted on a wooden block, if preferred. —F. H. Mason, San Diego, Calif.



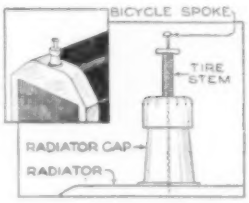
Efficient Cardboard Spectacles

While making a pinhole camera, it was discovered that when the observer looked through a pinhole in a square of blackened cardboard, with one eye, he was able to read a small sign across the street. A pair of spectacles was made, as an experiment, using lenses of blackened cardboard, with pinholes punched in them. Great care was taken in punching the holes to get them spaced to the exact distance between the pupils of the eyes. Wire was used for the temples and the nose piece. When completed, the spectacles proved to be very efficient, the principle involved being the same as that in stopping down the lens of a camera to secure greater definition. By making the holes in the cardboard larger, these spectacles can be used to protect the eyes from glare on a very bright day. They are particularly handy to have on a fishing trip when the sun flashes on the water.



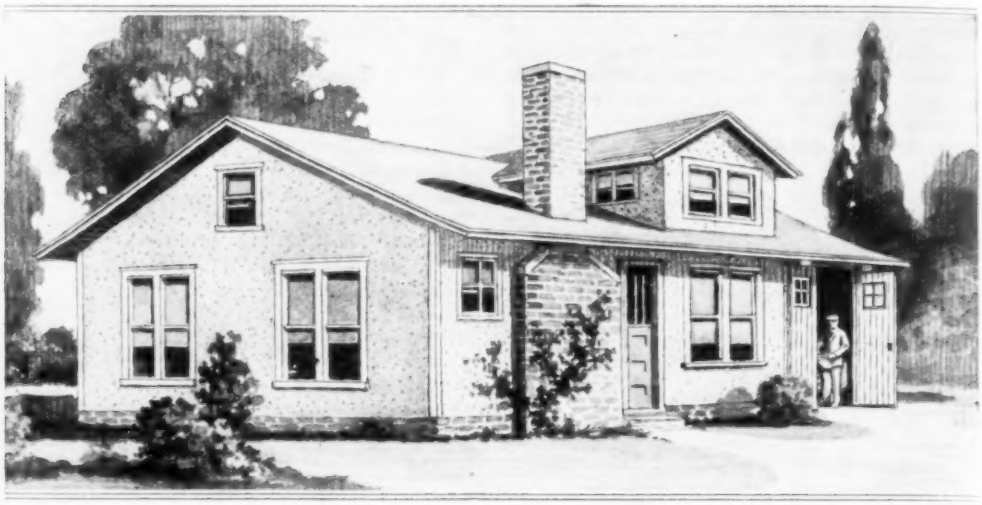
Safety Valve for Auto Radiators

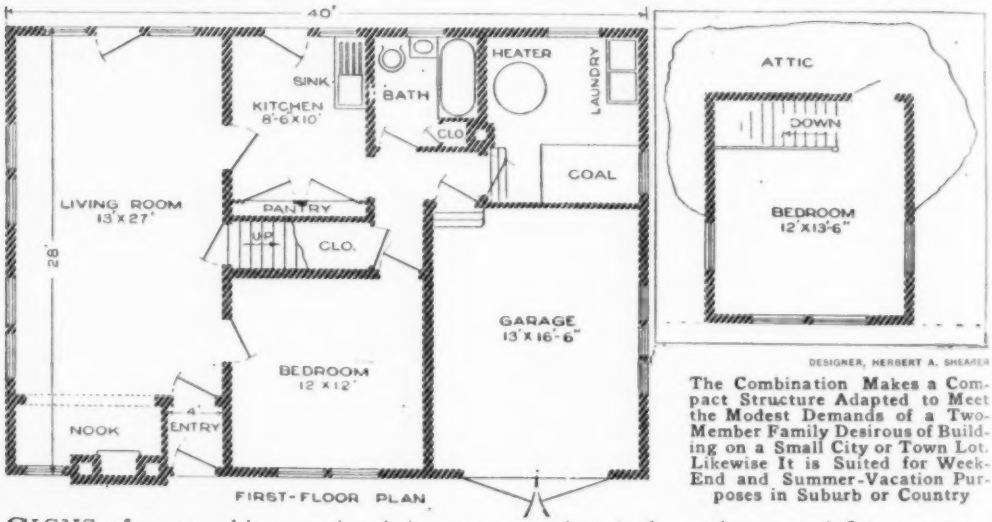
The owner of a light automobile, living in a mountainous country, had a great deal of trouble from the water in his radiator spilling out through the overflow pipe when going up or down hill or over rough places. He solved the difficulty by taking out the overflow pipe entirely, and providing a safety valve in the radiator cap to relieve any steam pressure which might be generated. He used a valve taken from an old inner tube, inverted and screwed into the radiator cap. The valve itself was removed from the stem, and a bicycle spoke cut off to the proper length, but with the head still on it, was dropped into the valve tube. This bicycle spoke acted as a check valve, keeping dirt from entering the radiator by permitting the steam to escape whenever its pressure was sufficient to lift up slightly the head of the bicycle spoke.



May
When you finish reading this magazine, place a 1-cent stamp on this notice, mail the magazine, and it will be passed on to the hands of our soldiers or sailors, destined
20 Cents

COMFORTABLE ALL-WEATHER WEEK-END COTTAGE





FIRST-FLOOR PLAN

DESIGNER, HERBERT A. SHEARER

The Combination Makes a Compact Structure Adapted to Meet the Modest Demands of a Two-Member Family Desirous of Building on a Small City or Town Lot. Likewise It is Suited for Week-End and Summer-Vacation Purposes in Suburb or Country

SIGNS of approaching spring bring up pictures of the summer cottage that is, perhaps, to be built some day. The accompanying plans, therefore, are a seasonable offering. Strictly, the cottage is an all-weather one, admirably adapted for the unfettered couple that cares to break away from the city apartment or hotel for a bit of a breathing spell in the open country whenever the spirit moves, be it summer or winter. It combines home and garage in one structure that may be "opened" or "closed" on brief notice. There is a living room, large enough for real comfort and, on the second floor, a spare chamber that permits the accommodation of a week-end guest on "occasions." The kitchen is compactly arranged and adjacent to the rear of the living room, so that the latter, at mealtime, may be used in lieu of a dining room. Thus the scheme considers the maidless woman. Hot-water heat and a fireplace provide for winter days as well as spring and fall weather. There is also a laundry. Modern plumbing and electric wiring complete the equipment. The structure may be erected for about $2,000.

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